IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF COLUMBIA

JULIUS W. HOBSON, et al.,	:	
Plaintiffs	:	
v.	:	Civil Action No. 82-66
CARL F. HANSEN, et al.,	:	
Defendants.	:	

Plaintiffs' Memorandum to the Court

Pursuant to this Court's order of September 1, 1970, as amended on September 24, 1970 and on November 24, 1970, plaintiffs submit the attached memorandum for the Court's consideration.

Respectfully submitted,

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Plaintiffs' Memorandum to the Court

Proceedings To Date

On May 19, 1970, Julius W. Hobson, an original plaintiff in the class action which lead to this Court's prior judgment and decree herein of June 19, 1967, filed an amended motion for both further relief and for the enforcement of the decree herein. On June 30, 1970, Mrs. Olivia P. Humphrey, individually and on behalf of her daughter, Amy M. Humphrey who attends Stanton Elementary School in Anacostia, moved to intervene in support of plaintiff Julius W. Hobson.[1] On July 6, 1970, defendants filed both an opposition to plaintiffs' May 19, 1970 motion and a motion of their own to vacate the decree of June 19, 1967 and dismiss plaintiffs' original complaint which led to that decree. In their memorandum of points and authorities filed in support of their opposition and motion of that date, defendants contended, _inter alia_, that "the extent of integration of faculties and demountables to relieve overcrowding is not believed to have had a substantial impact on the 1967-68 per pupil expenditure figures as it would have on later years" (at page 17). On July 7, 1970, three members of defendant Board of Education moved to strike

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[1] Mrs. Humphrey's motion to intervene is still pending before this Court.

the July 6, 1970 motion filed, *inter alia*, on their behalf. On July 14, 1970, plaintiffs moved for judgment on the pleadings and opposed defendants' motion to vacate the decree and dismiss the complaint. On that same date, defendants filed an opposition to Mrs. Humphrey's motion to intervene.

On July 16, 1970, this Court filed an order directing defendants to produce additional information. Included in that order was a direction that defendants file:

> a detailed recitation on a school-by-school basis of the steps taken and programs provided by the District of Columbia School Board to comply with the provision of this court's opinion that "[w]here because of the density of residential segregation or for other reasons children in certain areas, particularly the slums, are denied the benefits of an integrated education, the court will require that the plan include compensatory education sufficient at least to overcome the detriment of segregation and thus provide, as nearly as possible, equal educational opportunity to all schoolchildren." *Hobson* v. *Hansen*, *supra*, 269 F. Supp. at 515. *The costs of such steps and programs should be itemized as to each elementary school and the amounts and sources of the funds used detailed*. [at page 3; emphasis added.]

On August 10, 1970, defendants filed in the record three loose-leaf volumes of exhibits, together with an affidavit of Benjamin Henley, in response to this Court's order of July 16, 1970. A supplemental affidavit of Mr. Henley, also in response to the July 16 order, was filed on August 12, 1970. On that same date, this Court ordered defendants to file further data which was filed on August 21.

On August 17, 1970, plaintiffs moved to produce further information; defendants opposed. Plaintiffs' motion to produce was granted in part and denied in part by order of this Court on September 1, 1970. That order directed defendants to file in the record, *inter alia*:

> Projected per-pupil expenditure out of regular funds for teacher services rendered at each public elementary school in the District of Columbia for the school year 1970-1971, as well as the per-pupil expenditure out of regular funds for teacher services rendered at each public elementary school in the District of Columbia during the school year 1969-1970.

Also on September 1, 1970, in a memorandum opinion and order, this Court stated, inter alia:

> The best data now available to this court indicates that there still is a substantial differential in per-pupil expenditure which favors the elementary schools west of the Park. The area west of the Park is the richest in the district. The elementary school population of that area is also the whitest in the city. *** [I]t appears to the court that the richest and whitest area of the city is being substantially favored over poorer and blacker areas. A prima facie case of violation of the 1967 decree seems to have been made out. [at page 2; footnotes omitted.]

This Court then ordered defendants to:

> [1] indicate, by memorandum filed in the record in this case, why busing of pupils from low-income area, overwhelmingly black, over-crowded schools in the District to high-income area, whiter and underpopulated schools would not eliminate unnecessary differences in per-pupil expenditures relating to over-and undercrowding, which defendants concede to be one of the causes of the lingering and spectacular inequality in overall per-pupil expenditures. [at page 3.]
>
> [2] indicate, by memorandum filed in the record in this case, why the school board should not devise a plan to equalize within a five per cent variation expenditures for teaching costs out of regular funds among all District of Columbia elementary schools for the 1971 fiscal year. [at page 4.]

Plaintiffs were directed to answer defendants' memorandum; defendants were directed to reply to plaintiffs' answer.

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Defendants filed further data in the record on September 21, 1970, November 2, 1970, November 6, 1970, November 17, 1970, and November 27, 1970. On November 17, 1970, defendants also filed their memorandum in response to this Court's orders to show cause of September 1, 1970.

Preliminary Statement

The objective of the *Hobson* v. *Hansen* litigation has been and continues to be the creation of a floor of equity in the distribution of objectively measurable educational resources. These resources, which include teachers, books, etc., are most readily summarized in terms of per-pupil expenditure. We have not asked the Court to discriminate against the rich on behalf of the poor, or whites on behalf of the blacks. Instead, the case seeks to make constitutionally required equal educational opportunity a reality for all children in the D. C. public schools. Attached to this Memorandum are analyses, prepared by Julius W. Hobson (Appendix B) and Stephan Michelson (Appendix C), of the latest data filed in this Court by defendants.

As indicated in the Hobson Analysis, we are outraged both by the spread of $858 in total expenditures per pupil from the regular budget in fiscal 1970 between the Tubman Elementary School and the Perry Elementary School (two schools located in low income black communities) and by the spread of $662 in such expenditures between Tubman and the Mann Elementary School (located in a wealthy, predominantly white community West of Rock Creek Park).[2] In spite of the statistical gyrations which appear in defendants' Memorandum of November 17, 1970, the fiscal 1970 data show conclusively a widening inequity in expenditures per pupil between elementary schools in the District of Columbia, an inequity which has increased from $411

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[2] At page 36 of their November 17, 1970 Memorandum, defendants present a chart entitled "Number of Pupils Who Would Gain And Lose With Redistribution Of Resources Under 5% Teaching Cost Equalization". There is no way to know how many would gain or lose under plaintiffs' proposed plan until defendants designate "special schools" and those other schools which would be excepted from the 5% requirement because of the provision of compensatory education for educationally deprived pupils. However, if we assume, to take a logical example, the defendants designated all fiscal 1971 "special schools" and Model School Division schools as such exceptions, 34,086 children would gain and 26,232 children would lose from the proposed equalization. (Similarly, 12,412 "needy-lunch" children would gain, and 10,272 would lose.) See Chapter VIII of the Michelson analysis. The rationale of plaintiffs' argument, as presented in the text, is that these gains and losses must take place because the present apportionment of funds is discriminatory, unconstitutional, and a violation of this Court's 1967 opinion and decree.

in fiscal 1964 to $858 in fiscal 1970, leaving out the "special schools" for the mentally retarded and physically handicapped. The Court decreed in 1967 that steps be taken to eliminate this quantitative unfairness, steps such as bussing, reassignment of teachers, etc.

Defendants have stated to the Court on more than one occasion that they have been carrying out this decree. It is apparent from the fiscal 1970 data that they have not, but that, in fact, inequity now is more widespread than it was when this case was originally filed in 1966. The defendants are still operating the elementary schools on behalf of the rich at the expense of the poor. This discrimination is even more manifest when we focus on regular budget expenditures per pupil for teachers' salaries and benefits, as this Court requested in its orders of September 1,1970.

Argument

A. DEFENDANTS HAVE DISCRIMINATED ON THE BASIS OF BOTH ECONOMIC AND RACIAL STATUS IN EXPENDITURES PER PUPIL FOR TEACHERS' SALARIES AND BENEFITS FROM REGULAR BUDGET FUNDS.

This Court correctly concluded on September 1, 1970, that there still is a substantial differential in per-pupil expenditure which favors the whitest elementary school population and the richest area of the city -- the area West of Rock Creek Park. Data filed since this Court's September 1 ruling show that this differential has increased from fiscal 1970 to fiscal 1971. This finding is at direct odds with defendants' claims in July 1970 that the fiscal 1968 data relied on by plaintiffs in their May 19, 1970 motion were "untimely" because "the extent of integration of faculties and demountables to relieve overcrowding is not believed to have had a substantial impact on the 1967-68 per-pupil expenditure figures as it would have on later years." Thus, expenditures per pupil for teachers' salaries and benefits in fiscal 1970 were 24% higher West of Rock Creek Park ($551.80) than in the remainder of the City ($446.19) and 32% higher West of the Park than in Anacostia ($419.58). In fiscal 1971, expenditures per pupil for teachers' salaries and benefits were 30% higher West of Rock Creek Park ($642.91) than in the remainder of the City ($495.14) and 44% higher than in Anacostia ($446.03).[3/]

[3/] All data for fiscal 1970 and 1971 exclude only "special schools" for the mentally retarded and physically handicapped.

The bulk of defendants' Memorandum of November 17, 1970, is devoted to attempting to explain away these shocking statistics. As the examination of their arguments below shows, they have offered no adequate justification for these differentials.

1. Discrimination on the Basis of Economic Status.

a. The alleged negative correlation of -.08.

Defendants try to argue that their computation of an alleged negative correlation of -.08 between overall per-pupil expenditures from the regular budget in fiscal 1970 and latest available census data (1960 census) shows no violation of this Court's decree enjoining discrimination on the basis of economic status.[4/] Their analysis on this point is faulty for several reasons. First, even if the correlation had been computed correctly, all it would have shown would have been that discrimination in favor of some children from poor black neighborhoods East of Rock Creek Park at the expense of other children from poor black neighborhoods East of Rock Creek Park was so great that it obscured discrimination in favor of children from wealthy white neighborhoods West of Rock Creek Park. Second, the correlation was not computed correctly as shown in the attached Michelson analysis. The correct correlation is +.053 -- small, but positive. Third, when one looks at the correlation between income and expenditures per pupil for teachers' salaries and benefits in fiscal 1970 -- the focus this Court requested -- the correlation is a significant +.100 and rises to +.172 when special schools for the mentally retarded and physically handicapped are excluded (as plaintiffs' proposed remedy would do).

4/ After fluctuating back and forth in various filings from August through November, defendants ultimately accept 1960 census data as a valid indicator of economic status, with the qualification that certain areas of the City, namely Anacostia and the far Northeast, have probably declined in relative economic status from 1960 to 1970. *See* Affidavit of Benjamin Henley, August 10, 1970, page 10. *Compare* defendants' argument at pages 26 and 27 of their November 17 Memorandum that participation in the "free lunch" program in 1970 correlates "remarkably" with 1960 census data.

Defendants themselves forcefully underscore this discrimination on the basis of economic status in scatter diagrams nos. 1 and 2 of their November 17, 1970 Memorandum as outlined in the attached Hobson analysis. On diagram no. 1, for example, not a single school with median income per school of $8,500 and above in 1971 had average expenditures per pupil for teachers' salaries and benefits that deviated more than 5% below the city-wide average (as computed by defendants) of $499. In fact, all but 2 of these schools were more than 5% above the city-wide average. Large numbers of schools with median incomes below $8,500 did have expenditures of more than 5% below the city-wide average, some substantially below. Thus, this diagram and the others merely reinforce plaintiffs' contentions that per-pupil expenditures for teachers' salaries and benefits, if "random" at all, are "random" only for the poor. The rich are virtually guaranteed more money -- in almost every instance substantially more than 5% above the city-wide average.

b. The use of "free-lunch" data.

Defendants, on occasion, use "free-lunch" data in an attempt to show that this more recent data, allegedly a substitute for census data, disproves discrimination on the basis of economic status. Ultimately, however, this data is used to resuscitate 1960 census data and to reinforce defendants' claims that no correlation exists between per-pupil expenditures and economic status based on 1960 census data.[5] Again defendants' analysis is flawed. First, they assert that the percentage of elementary school students eligible for a free lunch in each elementary school would be an adequate substitute for census data on the income level of the neighborhood. Plaintiffs do not concede that proposition; eligibility data, if it were available, would exaggerate the percentage of "needy" children with respect to Social Security Administration poverty guidelines.[6]

5/ See footnote 4, supra.

6/ See U. S. Department of Commerce, "Selected Characteristics of Persons and Families, March 1970", Current Population Reports, P-20, No. 204, discussed in Chapter IV of the Michelson analysis.

However, defendants have not proffered eligibility data. Instead, they have sought to use data on participation in the free lunch program. This data is clearly not a proper substitute for eligibility data -- even assuming the validity of the latter. For example, Dr. Jean Mayer, formerly President Nixon's special advisor on health needs, notes that "two-thirds of America's indigent children are not reached by the school lunch program."[7/]

Finally, even if we were to accept participation in the free lunch program as a valid indicator of economic status, the data proffered by defendants again support plaintiffs' arguments. The expenditures per pupil for teachers' salaries and benefits West of Rock Creek Park where participation in the free lunch program is lowest are much higher than such expenditures East of Rock Creek Park where participation in the program is highest.

2. Discrimination on the Basis of Racial Status.

In an attempt to disprove clear evidence of violations of this Court's 1967 injunction against discrimination on the basis of racial status, defendants direct this Court's attention to the fact that bussing undertaken to relieve overcrowding has raised the black percentage of students in attendance at several schools West of Rock Creek Park: Fillmore, Hardy, Hyde, Jackson, and Key. The apparent plausibility of this argument is shattered, however, when we examine the remaining schools West of the Park which average over 85% white: Eaton, Hearst, Janney, Lafayette, Mann, Murch, Oyster, and Stoddert. Expenditures per pupil for teachers' salaries and benefits at these schools in fiscal 1970 ($539.75) were 21% higher than in the rest of the City ($446.77), and 29% higher than in Anacostia ($419.58). In fiscal 1971, this differential increased as expenditures per pupil for teachers' salaries and benefits in these schools ($606.80) were 23% higher than in the rest of the City ($494.28), and 36% higher than in Anacostia ($446.03). Defendants have not bussed substantial numbers of black students into these eight schools, but have nevertheless continued to give them favored treatment.

[7/] Quotation from the Modesto (California) Bee, September 11, 1969 reprinted in Hearings before the Select Committee on Nutrition and Human Needs of the U. S. Senate, 91st Cong., 2d Sess., Part 2, at page 503 (1970). Further support for our contentions about the inadequacy of "participation" data appears in Chapter IV of the Michelson analysis.

B. DEFENDANTS HAVE OFFERED NO ADEQUATE JUSTIFICATION FOR THE LINGERING AND SPECTACULAR DIFFERENTIALS IN EXPENDITURES PER PUPIL FOR TEACHERS' SALARIES AND BENEFITS FROM REGULAR BUDGET FUNDS.

1. School Size.

a. Economies of scale.

As part of their attempt to adequately justify the lingering and spectacular differentials in per-pupil expenditures outlined above, defendants rely for purposes of argument (but not for purposes of evidence?) on an article by June O'Neill and Arlene Holen, published in The Washington Post on October 15, 1970. This article contends that 100% of the differentials in per-pupil expenditures which exist in District of Columbia elementary schools are attributable to differences in the size of those schools. (Size is defined as the number of pupils in attendance not the physical size of the building.) The thesis of the O'Neill-Holen article is invalid as both argument and evidence.

First, the O'Neill-Holen argument is based on the data for total expenditures per pupil from the regular budget in fiscal 1970 not on data for expenditures per pupil for teachers' salaries and benefits -- the concern of this Court's show cause order. Second, O'Neill and Holen failed to control for other variables when preparing the simplistic table which appears in their article. When other variables are properly controlled, as demonstrated in Chapter VI of the Michelson analysis, size alone accounts for no more than 15% of the variations in expenditures per pupil for teachers' salaries and benefits in fiscal 1970.

Finally, plaintiffs reject the contention that size itself is a "neutral" factor in D. C. elementary schools. As shown below, the distribution of overcrowding and pupil-teacher ratios again favors the whitest and wealthiest areas of the City and constitutes discrimination for which defendants are responsible. Thus, plaintiffs contend that the only permissible boundaries for

variations according to size in per-pupil expenditures for teachers' salaries and benefits from regular budget funds are set by the 5% deviation set forth in plaintiffs' proposed order attached hereto.[8]

b. The pattern of overcrowding and pupil-teacher ratios

In fiscal 1970, again excluding only "special schools", the pupil-teacher ratio West of Rock Creek Park was 6% smaller than in the rest of the City and 13% smaller than in Anacostia. In fiscal 1971, the pupil-teacher ratio West of Rock Creek Park was 12% smaller than in the rest of the City and 19% smaller than in Anacostia. In extolling the beneficial effects of reducing overcrowding in his Supplemental Affidavit filed herein on August 12, 1970, Benjamin Henley stated at page 5: "Reduction of overcrowding in elementary schools may be misinterpreted as a mere transfer of children, accounted for by statistical data. However, reduction of overcrowding has produced rich benefits; the primary one is the reduction in teacher-pupil [sic] ratios, which maximizes opportunities for optimum teaching and learning".[9] Unfortunately, it is again the schools in the richest and whitest areas of the community which continue to enjoy these rich benefits at the expense of the poor and black communities.

Although overcrowding city-wide has been reduced, latest available enrollment data (as of October 22, 1970 and including demountable classrooms) show the following revealing facts:

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[8] To the extent that Point of Clarification No. 6 on page 8 of the September 18, 1970 Office of Education "Advisory Statement on Development of Policy on Comparability" might be construed as permitting a greater than 5% deviation on the grounds of differences in school size, plaintiffs contend that there is no adequate justification for such an additional deviation under the facts and law of this case and that this Court should not permit such an additional deviation.

[9] On this record, plaintiffs are at a loss to explain the contention by the Corporation Counsel on behalf of defendants in their November 17, 1970 Memorandum at page 30 that "although popular agreement would probably have it that low pupil-teacher ratios are advantageous, test results are ambiguous."

(1.) There are 19,193 surplus seats in D. C. elementary schools.

(2.) The schools West of Rock Creek Park are operating at an average of 73.0% of capacity.

(3.) The schools in the rest of the City are operating at an average of 82.9% of capacity.

(4.) Despite the enormous surplus of seats, 13 elementary schools -- all located East of Rock Creek Park -- are operating at over 100% of capacity ranging from 100.3% at Whittier to an incredible 160.4% at Ketcham and Annex.

Under this Court's prior decision herein of June 19, 1967, defendants are required to distribute objectively measurable educational resources equally throughout the elementary schools. With respect to overcrowding, defendants have failed to meet this standard because in the present situation of surplus capacity, it is the actual city-wide average of 82.4% capacity, and not 100% capacity, by which defendants' conduct must be judged.

c. Bussing.

On September 1, 1970, this Court ordered defendants to show cause why additional bussing of pupils would not be one available means to alleviate inequalities in per-pupil expenditures due to overcrowding. Plaintiffs contend that defendants' November 17, 1970 response to this portion of the September 1, 1970 show cause order is entirely deficient. These deficiencies are set forth in the Hobson analysis (No. 1) and Chapter V of the Michelson analysis (Nos. 2 & 3) attached hereto. Several of the conclusions of these analyses merit brief comment:

(1.) The attempt by defendants at page 22 of their November 17, 1970 Memorandum to reduce income level of the neighborhood by percent of bussed-in children is statistically invalid.

(2.) Contrary to defendants' conclusions at page 15 of their November 17, 1970 Memorandum, proper methods of calculation show that the annual cost of bussing 30 children is actually much cheaper than the annual cost for the use of a demountable classroom by the same number of children.

(3.) Considerably more bussing of pupils from overwhelmingly black, overcrowded schools East of Rock Creek Park to undercapacity, predominantly white schools West of Rock Creek Park could be undertaken without changing the predominantly white status of the receiving schools.

Finally, the attempt by defendants to use newspaper articles and other hearsay with respect to parents' attitudes concerning the desirability of bussing vs. demountable classrooms is clearly improper and inadmissible evidence. With respect to evidence which is properly before this Court, plaintiffs note the favorable discussion of bussing to relieve overcrowding at pages 4-6 of Benjamin Henley's Supplemental Affidavit filed August 12, 1970, wherein Mr. Henley refers to "improved educational opportunities created through bussing" (page 4). Plaintiffs are prepared to introduce, if requested, sworn oral testimony or written affidavits directly contradictory to the hearsay evidence proffered by defendants.

2. The Clark Plan.

Defendants allege that there may be a conflict between provisions of the so-called "Clark Plan" and the proposed 5% order. To make this point, defendants present an article by Robert Hartman in the September 13, 1970 edition of The Washington Post which contends there might be such a conflict. Plaintiffs reject defendants' argument for the following reasons: First, defendants have never served on plaintiffs nor filed with the Clerk of this Court a copy of the Clark Plan, so that the Clark Plan is not properly before this Court, and plaintiffs are unable to determine whether the asserted conflict exists.[10]

Secondly, the thrust of Hartman's article is that the Clark Plan, if implemented, would, *inter alia*, require that teachers be compensated based on the performance of their students on certain standardized tests. Assuming, for the moment, that the

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[10] For example, plaintiffs do not know what budget source will be used to implement the teacher pay incentive aspects of the Clark Plan: regular budget, Title I, impact aid, other, or a combination.

D. C. school administration were to adopt this method of payment, plaintiffs' proposed 5% equalization order would require only that teachers who are paid more on the basis of superior performance under the new payment plan be equitably assigned throughout the elementary school system so as not to violate the 5% rule.

Finally, the exceptions in plaintiffs' proposed order for "special schools" and for compensatory education for educationally deprived pupils would permit concentration of higher paid teachers under the Clark Plan in those schools.[11]

To the extent, if any, that the payment formula under the Clark Plan would still conflict with the proposed 5% equalization order despite the considerations outlined above, plaintiffs contend that the order should prevail over the plan because the plan would then deny equal protection under the law of this case.

3. Teacher Quality.

Another of the arguments raised by defendants against the proposed 5% order has by now become shopworn. It was raised when the case was first tried in 1966 -- and rejected by this Court in its 1967 decision. It was raised again by defendants in July of this year -- and rejected by this Court in its September 1, 1970 four-page memorandum opinion. It is, of course, the argument that teacher quality is not necessarily related to teacher compensation. A subcategory of this argument is that increments in pay awarded solely on the basis of longevity of service should not be counted in the proposed 5% equalization order. Plaintiffs emphatically and unequivocally reject these arguments for several reasons.

First, the law of this case is that all teacher compensation from the regular budget should be included. Second, the reasons why that is the law of this case remain true, and defendants have offered no new evidence to warrant a change in that

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[11] A more detailed recitation of the errors in the Hartman arguments relied upon by defendants is presented in Chapter III of the attached Michelson analysis.

result. In 1967 and again on September 1, 1970, this Court eloquently reiterated those reasons. Chief among them is the proposition that the D. C. school system, not this Court, has selected a method of compensation of teachers which includes graduate degrees obtained,[12/] longevity of service, and other factors. It is not for this Court to conclude, without very substantial evidence, that this method of compensation is inherently improper. However, it is incumbent upon this Court under its 1967 decree to insure that whatever method of compensation the D. C. School Administration selects -- be it the present system, the Clark Plan, or any other plan -- that that method be administered so as equitably to distribute per-pupil expenditures for teachers' salaries and benefits in D. C. elementary schools.

It is also incorrect to suggest, as defendants have, that plaintiffs' proposed remedy would force upon pupils in low income, overwhelmingly black schools, teachers who despite long experience (perhaps in a high income, overwhelmingly white school West of Rock Creek Park) are not suited or inclined to teach in a ghetto school. As this Court stated on September 1, 1970, "if it is too burdensome for the school board to spread such [highly salaried] teachers evenly throughout the system, then it would seem that the schools which do not have their share of such teachers should be compensated with a corresponding benefit, as for example with *** teaching assistants, et cetera." (at page 4)

A case in point is Stanton Elementary School, attended by intervening plaintiff, Amy M. Humphrey. In fiscal 1971, expenditures per pupil for teachers' salaries and benefits at that school and its Annex are projected at $439.30. The city-wide average expenditure per pupil for teachers' salaries and benefits projected for that year, exclusive of "special schools," is $501.20. Defendants' November 6, 1970 submission indicates a

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[12/] Plaintiffs direct this Court's attention to the fact that data filed by defendants show that in fiscal 1970, the percentage of teachers West of Rock Creek Park with masters degrees or higher was 22% while in Anacostia it was 12%.

membership at Stanton of 1,361. Thus, if expenditures per pupil for teachers' salaries and benefits at Stanton had been at the city-wide average, Stanton would have received $84,245.90 more money (1,361 [$501.20 - $439.30]). That money could have been used to employ several additional teachers interested in teaching there.

Plaintiffs dispute defendants' assertion at page 31 of their memorandum of November 17, 1970, that "the record in this case is devoid of evidence to substantiate any court order that would compel equalization of per pupil expenditures for instructional salaries which includes an increment for longevity of service." We remind defendants that this case was affirmed on appeal in 1969. However, if any doubt remains on this point, plaintiffs respectfully refer this Court to the additional evidence from scholarly journals compiled in Chapter III of the Michelson analysis which, we contend, is sufficient to justify the inclusion of such pay.

Finally, plaintiffs contend that the Office of Education exception for longevity pay contained in its September 18, 1970 "Advisory Statement on Development of Policy on Comparability" violates the law of this case, denies equal protection, and should be rejected by this Court. Plaintiffs further allege on information and belief that said exception -- absent from the comparability requirements insisted upon by the Office of Education only 10 months ago [13] -- was included in said Statement as a result of political pressure on the Office of Education, and plaintiffs are prepared to provide sworn oral testimony or affidavits to that effect if this Court so requests.

4. Impact Aid.

Plaintiffs restate their position that impact aid funds should not be included in the 5% equalization order because, in the District of Columbia, Congress has required that these funds

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[13] See Office of Education, Program Guide No. 57, February, 1970.

be concentrated in the "underprivileged attendance areas" of the city.[14/] On this point, plaintiffs incorporate herein by reference their arguments on this issue in their May 19, 1970 and July 14, 1970 motions.

5. The Teachers' Union Contract.

At page 14 of his Supplemental Affidavit of August 12, 1970, Benjamin Henley alleges that shifts in teaching personnel which might be required to comply with the 5% equalization order "would breach the contract which has been effected with the Washington Teachers Union." Stated simply, Mr. Henley is in error. That contract provides, *inter alia*:

> Article IV, B:
>
> The fundamental transfer policy shall take into consideration the following factors:
>
> 5. legal requirements as ordered by the courts or Congress.

It provides further:

> Article XXII, A:
>
> If any provision of this Agreement is or shall at any time be contrary to law, then such provision shall not be applicable or performed or enforced, and substitute action, if any, shall be subject to appropriate consultation and negotiation between the parties.

Even if neither of these provisions were present, the contract could not stand if it violated a court decree or the equal protection clause.

C. DEFENDANTS HAVE FAILED TO PROVIDE THIS COURT WITH SUFFICIENT DATA UPON WHICH TO DETERMINE WHETHER OR NOT THEY HAVE COMPLIED WITH THIS COURT'S 1967 HOLDING THAT COMPENSATORY EDUCATION MUST BE PROVIDED IN CERTAIN SCHOOLS.

As noted above, on July 16, 1970, this Court ordered defendants to file in the record herein "a detailed recitation on a

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[14/] In other areas of the country, where there may be no such Congressional requirement, the Office of Education may be justified in requiring, as it does in its September 18, 1970 "Advisory Statement on Development of Policy on Comparability", that impact aid funds be included within its equalization requirements.

school-by-school basis of the steps taken and programs provided" for compensatory education in certain schools. "The costs of such steps and programs should be itemized as to each elementary school and the amounts and sources of the funds used detailed."

On August 10, 1970, defendants filed herein certain material allegedly responsive to this order. That material appears in all 3 of the looseleaf volumes filed herein by defendants on August 10, 1970 and is "summarized" at pages 14-19 of the affidavit of Benjamin Henley filed herein on that date. The presentation of this material is so confusing as to defy school-by-school comparisons because certain costs are itemized as to some schools and not others; certain costs are itemized as to all schools; certain costs are not itemized at all; certain costs are included in per-pupil expenditure figures; and certain costs are not included in per-pupil expenditure figures. The presentation obscures, among other things, the exact extent to which compensatory programs are being undertaken through the expenditure of regular budget funds as distinguished from special federal compensatory funding sources such as Title I ESEA and impact aid.

Conclusion

For the reasons outlined above, in plaintiffs' motions of May 19, 1970 and July 14, 1970, and in the attached analyses

of Julius W. Hobson and Stephan Michelson incorporated herein by reference, plaintiffs hereby respectfully urge that this Court issue the proposed order attached hereto.

Respectfully submitted,

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Certificate of Service

I, Peter F. Rousselot, hereby certify that: one copy of the foregoing Plaintiffs' Memorandum to the Court, together with the Proposed Order and Hobson and Michelson analyses attached thereto, was sent by first class mail, postage prepaid, this 8th day of December, 1970, to defendant Superintendent of Schools of the District of Columbia and to each member of defendant District of Columbia Board of Education at 415 12th Street, N. W., Washington, D. C. 20004; three copies of the aforementioned documents were hand delivered to Thomas R. Nedrich, Esquire, Room 308, District Building, Washington, D. C., an attorney for defendants; and that one copy of the aforementioned documents was sent by mail as aforesaid to John A. Bleveans, Washington Lawyers' Committee for Civil Rights Under Law, 1025 15th Street, N. W., Washington, D. C. 20005, attorney for intervenors Elizabeth A. Budd, et al.; Don R. Allen, 1775 K Street, N. W., Washington, D. C. 20006, attorney for intervenors Mr. and Mrs. William Bennett; and to Stephen B. Ives, Jr., 1320 19th Street, N. W., Washington, D. C. 20036, attorney for intervenors Richard T. Stout, et al.

Peter F. Rousselot

Peter F. Rousselot

Appendix A

Proposed Order

A. On or after February 1, 1971, per-pupil expenditures for all teachers' salaries and benefits from the regular District of Columbia budget (*excluding* impact aid funds, Title I ESEA funds, UPO funds, and, in general, all funds not from the regular congressional appropriation) in any single elementary school (*not* "administrative unit"), shall not deviate by more than 5% from the mean per-pupil expenditure for all teachers' salaries and benefits at all elementary schools in the District of Columbia school system *as that mean is defined in this paragraph*. The 5% limit may be exceeded only for "adequate justification" shown to this Court in advance. "Adequate justification" shall include only provision of compensatory education for educationally deprived pupils at certain schools or provision of special educational services for the mentally retarded or physically handicapped at certain schools. For purposes of this order, the "mean" shall be computed *after* excluding from the computation total expenditures for all teachers' salaries and benefits and total ADM at all schools for which permission to exceed the 5% limitation is sought and granted.[*]

B. By February 1, 1971, by November 1, 1971, and by November 1 of each succeeding year thereafter, defendants shall serve on plaintiffs, file with the Clerk of this Court, and cause to be disseminated to all parents of elementary school children in the District of Columbia information sufficient to establish compliance with this order for equalization of per-pupil expenditures for all teachers' salaries and benefits. At a minimum, such information shall include, in tabular form for *every* elementary school (*not* administrative unit), data in the following categories: (1.) Name of school; (2.) Income

---

[*] The simple steps involved in performing this computation are set forth at pages 140-141 of the attached Michelson analysis.

Level of the neighborhood from latest available U. S. Census data; (3.) Average Daily Membership; (4.) Total number and percentage of students of each race as of a date not more than 30 days preceding the filing deadline; (5.) Building percentage over-and under-capacity and surplus or deficit of seats based on data filed in answer to category (3.) above; (6.) Total number of Teachers (for purposes of this calculation the only teachers to be included shall be those whose salaries and benefits are included in items (10.) and (11.) below); (7.) Pupil-Teacher ratio (item (3.) divided by item (6.)). (8.) Total operating expenditures from the regular D. C. congressional appropriation only; (9.) Per-pupil operating expenditures from the regular D. C. congressional appropriation only; (10.) Total expenditures for all teachers' salaries and benefits from the regular D. C. congressional appropriation only; (11.) Per-pupil expenditures for all teachers' salaries and benefits from the regular D. C. congressional appropriation only; (12.) Total expenditures from impact aid funds; (13.) Per-pupil expenditures from impact aid funds; (14.) Total expenditures under Title I of the Elementary and Secondary Education Act of 1965; (15.) Per-pupil expenditures under Title I of the Elementary and Secondary Education Act of 1965; (16.) Total expenditures from UPO funds; (17.) Per-pupil expenditures from UPO funds; (18.) Total expenditures from all sources; (19.) Per-pupil expenditures from all sources.

The tabular form shall also include the mean as defined in paragraph A. above, together with the upper and lower dollar bounds from that mean computed by adding to and subtracting from that mean 5% of that mean.

C. In each report filed and disseminated pursuant to the requirements of paragraph B. above, there shall be prominent and specific identification of the respects, if any, that the methods of computing the data in that report differ from the methods used in computing the comparable data for the preceding year.

IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF COLUMBIA

JULIUS W. HOBSON, et al., :
Plaintiffs :
v. : Civil Action No. 82-66
CARL F. HANSEN, et al., :
Defendants. :

Affidavit of Julius W. Hobson

District of Columbia, ss:

Julius W. Hobson, an original plaintiff in this case, being duly sworn on oath, deposes and says that he is the author of the attached analysis of data on per pupil expenditures submitted to this Court by defendants pursuant to orders of this Court in Hobson v. Hansen, Civil Action No. 82-66.

Julius W Hobson
Julius W. Hobson

Sworn and subscribed to before me
this 2nd day of December, 1970

Elizabeth A. Baldwin
Notary Public, D.C.

My Commission Expires: June 14, 1975

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ANALYSIS

Chart 1.

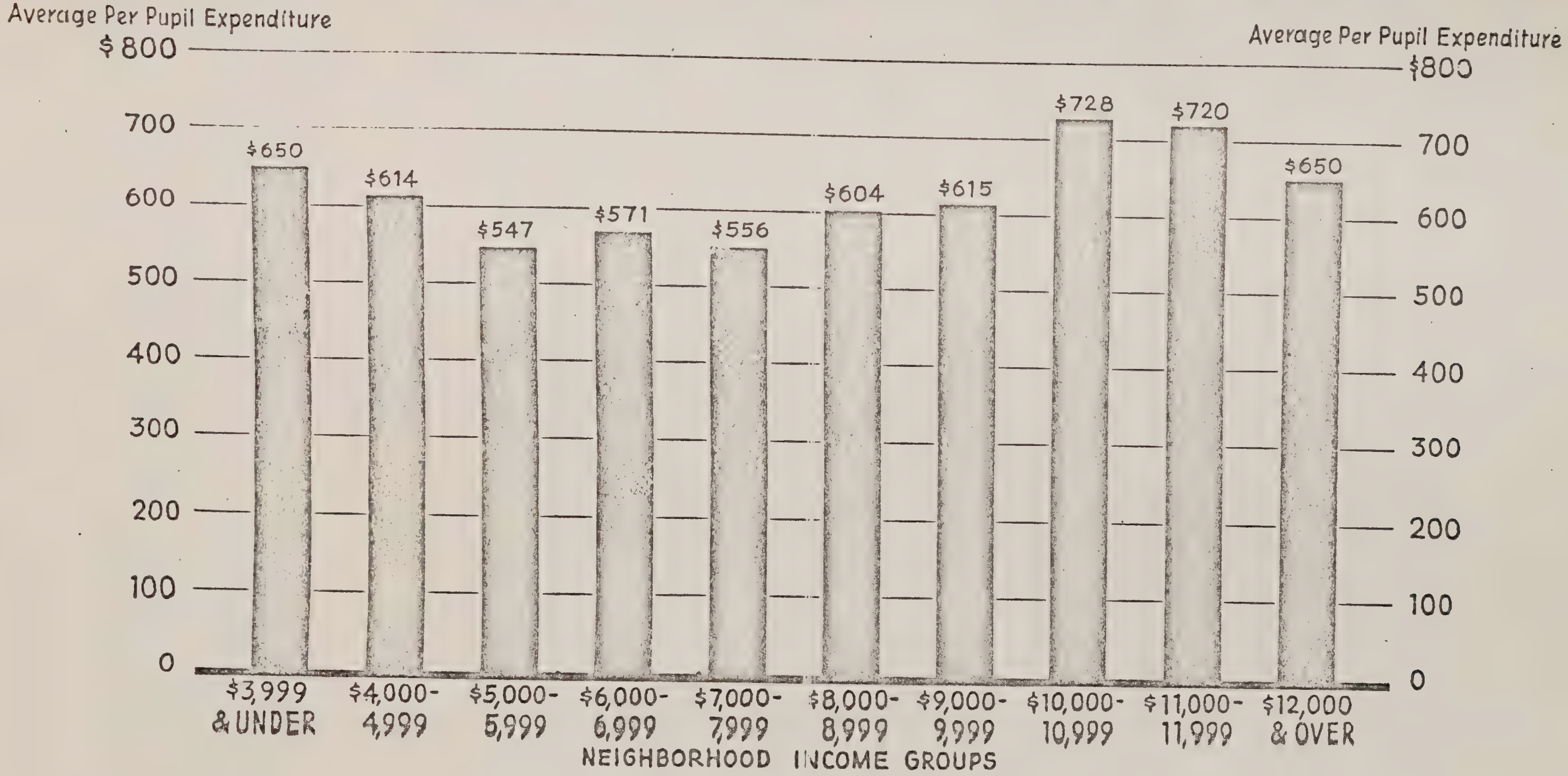
Chart 1 shows the average total operating expenditure per pupil from regular funds in the elementary schools of the District of Columbia by neighborhood income groups, fiscal year 1969-70. An average of the original data submitted to the Court by the School Administration (total expenditures per school divided by the total numbers of pupils per school) shows that in the three richest and whitest neighborhoods ($10,000 and above) the School Administration spends on an average of $94 more per pupil than it does in the three poorest and blackest neighborhoods with income below $6,000. If the same average is taken at the $8,000 and above income levels, it shows that the School Administration spends about $75 more per pupil in schools located there, than it does on pupils in schools located in neighborhoods with income levels below $8,000.

The chart clearly shows a pattern of spending by the D.C. Public School Administration which benefits the richer and whiter communities in the City.

Chart 1.

D.C. PUBLIC SCHOOLS

AVERAGE EXPENDITURE PER PUPIL IN THE ELEMENTARY SCHOOLS, BY NEIGHBORHOOD INCOME GROUPS, FISCAL YEAR 1969-70



The D.C. Public School Administration spends an average of $94 more per pupil in the communities with incomes of $10,000 or more than it does in the communities with incomes of $5,000 or less.

Source: D.C. Public Schools

Chart 2.

Chart 2 shows total operating expenditures per pupil from regular funds in selected D.C. elementary schools, 1969-70. According to the chart, and leaving aside "special schools," the D.C. Public School Administration spent the largest amount of money per pupil ($1,163) at the Perry Elementary School in the school year 1969-70, and the smallest amount per pupil ($305) at the Tubman Elementary School.[1/] This shows an expenditure gap between these schools of an unbelievable $858 per child.

In 1966 when the original complaint was filed, (Hobson v. Hansen) data for the 1964 school year was used which showed a per pupil expenditure inequity between the lowest and highest elementary schools of some $411. Chart 2 states in the footnote that the astronomical inequity of $858 for 1970 represents an increase over 1964 (then $411) of over 100 percent.

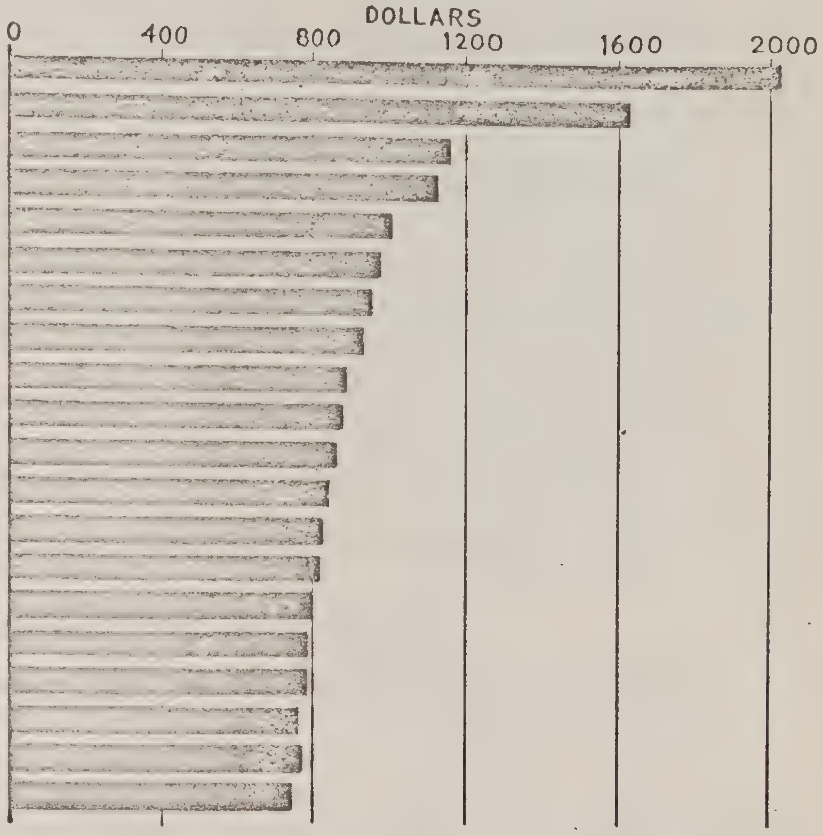
Thus, the data indicate that through the school year 1969-70 the D.C. Public School Administration continued to carry out spending practices in the City's elementary schools which, inspite of a Court order to the contrary, created greater inequity and unfairness.

1/ In the 1969-70 school year the Administration spent as low as $104 per pupil at the Morgan Annex. We used Tubman in our analysis however, because it is comparable to Perry, and because the Administration does not make clear the differences between the Morgan Elementary School and the Morgan Annex. In fact in some cases the Administration reports expenditures per pupil for combined elementary schools and annexes.

Chart 2.

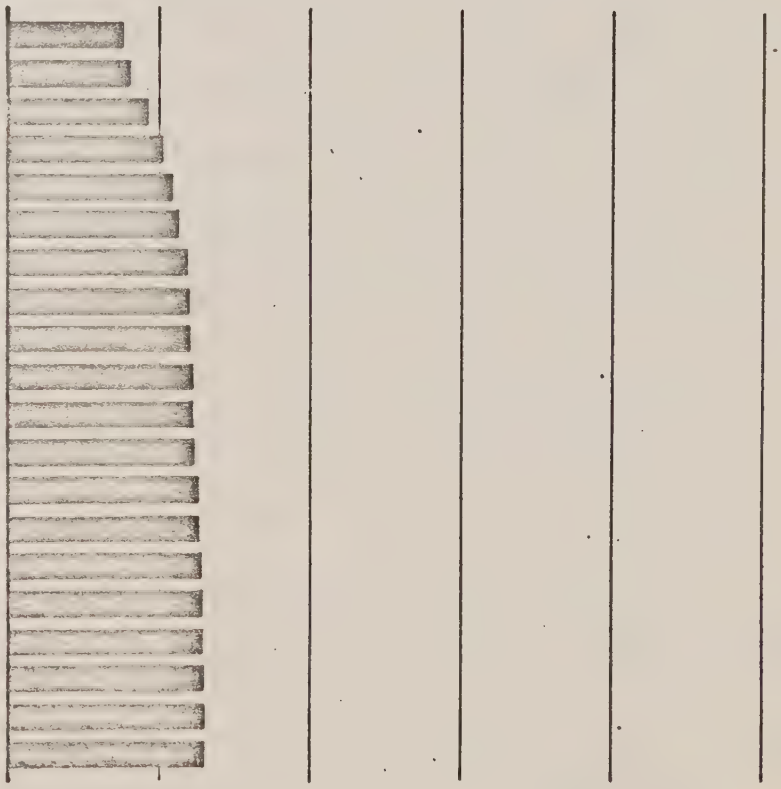
EXPENDITURES PER PUPIL IN SELECTED D.C. ELEMENTARY SCHOOLS, 1969-1970

HIGHEST EXPENDITURE GROUP



	Regular Budget
BUNDY	$2024
GRANT	1625
PERRY	1163
NICHOLS AVE.	1132
GRIMKE	1000
MANN	967
LENOX	949
STEVENS	930
POWELL	881
FILLMORE	873
HYDE	855
EDMONDS	830
LENOX ANNEX	812
CLEVELAND	806
KEY	794
MORGAN	776
HARDY	772
STODDERT	753
JANNEY	761
HEARST	746

LOWEST EXPENDITURE GROUP



TUBMAN	$ 305
POWELL ANNEX	327
SAVOY	375
RANDLE HIGHLANDS	407
HENDLEY & ANNEX	438
CONGRESS HEIGHTS & ANNEX	454
KIMBALL	472
NALLEY	476
McGOGNEY	477
GARFIELD	485
DAVIS & ANNEX	491
SIMON	492
SLOWE	501
PATTERSON	508
KITCHAM & ANNEX	512
BENNING & ANNEX	513
DRAPER	515
LAFAYETTE	516
CARVER	517
RINGSMAN	518

In 1964 the spread between the highest and lowest school was $411. By 1970 the spread equaled $858 leaving aside "special schools." The above data for 1970 show that the spread has increased from 1964 by over 100% leaving aside "special schools."

Source: D.C. Public Schools

Chart 3.

The School Administration has advanced the low or slightly negative coefficient of correlation (-.08) obtained when schools are "ranked first by median neighborhood income, and second by mean expenditures per pupil" as proof that the wide variation in expenditures per pupil between individual schools do not reflect any economic or racial bias. However, the most elementary inspection of the data on which the School Administration's coefficient of correlation is based readily leads to the conclusion that the statistical method used to arrive at the -.08 coefficient is improper as demonstrated in the Michelson Affidavit filed concurrently herewith.

Chart 3 is entitled "Relation of Average Per Pupil Expenditures to Neighborhood Income Levels, 1969-70." The apparent statistical conclusion drawn from the data on this chart is that any attempt to compute a coefficient of correlation using these data would be misleading to say the least. The chart shows each elementary school in the District of Columbia on a graph cross relating neighborhood income and average operating expenditures per pupil from regular funds. In 1969-70 the rounded city-wide average expenditure per pupil in the elementary schools was $586. Of the 53 schools shown with average expenditures below the city-wide average, only five were located in neighborhoods with incomes above $8,000. In the neighborhoods with incomes below $8,000, forty-eight schools had per pupil expenditures below the city-wide average. Expressed in percentages, the data shows that only 25 percent of the schools located in the wealthier neighborhoods had expenditures below the city-wide average, while more than 43 percent of the schools in the poorer neighborhoods (incomes below $8,000) were so situated.

The Keene Elementary School had the lowest average expenditure per pupil ($541) found in any elementary school located

in the wealthier neighborhoods ($8,000 and above incomes). This represents a deviation from the city-wide average of only a minus 7.7 percent. By contrast, Tubman, a school comparable to Perry, and located in the poorer neighborhoods, (incomes below $8,000) had a low expenditure of $305 per child, an amount which deviated from the city-wide average by an unbelievable minus 48.0 percent. The deviation from the city-wide average in the poorer communities was more than six times the deviation from the city-wide average by the lowest school in the wealthiest community.

The chart shows clearly that the "crazy quilt" or "random" nature of the spending pattern is concentrated among the low income area schools where there appears to be no correlation between neighborhood income and per pupil expenditures. No one ever seriously suggested that there was. Between the rich and poor income areas, however, the chart shows that there is clearly differential spending in the elementary schools of D.C. based on the income. Put another way, children in wealthy neighborhoods have only a slight chance of being assigned to elementary schools where the expenditure per pupil is less than the city-wide average. By unfortunate contrast, children in poorer neighborhoods face a substantial probability of assignment to schools where such expenditures are way below the city-wide average.

This discrimination against the poor becomes much more pronounced when we examine two scatter diagrams (nos. 1 and 2) filed by defendants on November 17, 1970. Scatter diagram no. 1 is entitled "Relation Between Teacher Expenditures Per Pupil Fiscal 1971 and Family Income Level of School", and scatter diagram no. 2 is entitled "Relation Between Teacher Expenditures Per Pupil Fiscal 1970 and Family Income Level of School".

First of all, these diagrams report figures which are described as "Median Income per School." They are presumably based on data appearing in the three page chart in Part 1, subpart 2 of Volume I of exhibits filed in this Court be defendants

on August 10, 1970. According to the Census Bureau, the only possible way to arrive at median income per school is to know the exact income of each parent of each child located in each school. From these data it would be possible to arrive at a figure which could be called "median income per school." There is nothing in the defendants' submissions before this Court which indicates that they have such information. Therefore their designation, "Median Income per School," is statistically invalid and incorrect.

By contrast, the plaintiffs' scatter diagram entitled "D.C. Elementary Schools -- Relation of Average Per Pupil Expenditures to Neighborhood Income Levels, 1969-70" (Chart 3) shows neighborhood median income obtained from the U.S. Bureau of the Census. This is income based on Census tract data and, according to the factors which go to make up this income, is not directly related to school children. The plaintiffs' scatter diagram therefore is not directly comparable to the defendants' scatter diagrams nos. 1 and 2.

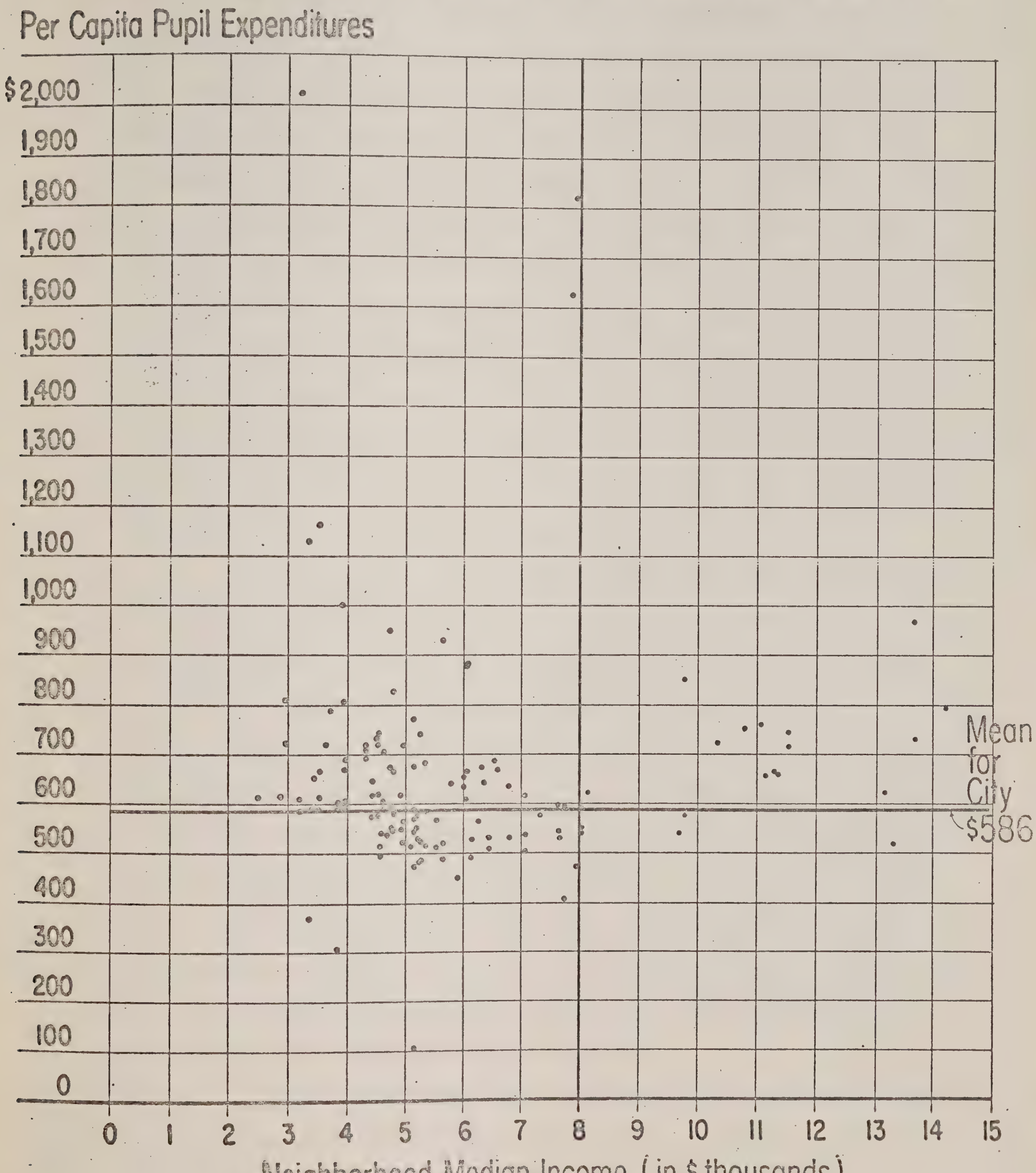
However, even assuming that the calculations produced by the defendants which they call "Median Income per School" are valid, their diagrams still show more crass discrimination against the poor on behalf of the wealthy than does the plaintiffs' scatter diagram. For example, on diagram no. 1, not a single school with median income per school of $8,500 and above in 1971 had average expenditures per pupil based on teachers' salaries that deviated more than 5% below the city-wide average of $499. All but 2 of these schools were more than 5% above the city-wide average. However, there were large numbers of schools with median incomes below $8,500 showing expenditures of more than 5% below the city-wide average. Some were shockingly far below that average. Similarly, diagram no. 2 for the fiscal year 1970 reported a city-wide average based on teachers' salaries of $452 in the elementary schools. It appears by inspection that one and

maybe two of the elementary schools with median income per school of $8,500 and more had expenditures below the city-wide average, but nowhere near 5% below the city-wide average, while in the communities where the median income per school was below $8,500, large numbers of elementary schools had expenditures based on teachers' salaries far below 5% of the city-wide average. Thus, assuming a validity for defendants' calculations, these scatter diagrams serve only to reinforce plaintiffs' argument that per pupil expenditures for teachers' salaries and benefits in D.C. public schools are "random" only for the poor. The rich are virtually guaranteed more money -- in almost every instance, substantially more than 5% above the city-wide average.

Chart 3.

D.C. ELEMENTARY SCHOOLS

Relation of Average Per Pupil Expenditures to Neighborhood Income Levels, 1969-70



SOURCE: D.C. PUBLIC SCHOOLS

Income Level of Neighborhood vs. Income Level of School

Defendants' November 17, 1970 Memorandum, at pages 21-22 attempts to excuse the gap in expenditures per pupil on the grounds that poor children are being bussed into the schools with the higher expenditures per pupil, which, even if true, still leaves the children from the sending school in a position of being discriminated against. The School Administration attempts to justify this reasoning by adjusting the income level of the neighborhood in which the receiving school is located by the proportions of receiving school student body that bussed children comprise. Strangely enough, if this argument were statistically valid, which it is not, they would have to also adjust the income level of the sending school, which might well be downward. (See Chapter V of the Michelson analysis.)

This method of "adjusting" neighborhood income levels has not appeared in the Hobson v. Hansen case before. During the original trial of the case in 1966, we carefully discussed the economic level of the neighborhoods where the schools are located. This is quite different from discussing median family income of the schools. As noted above, to our knowledge, there are no valid data available on which to base a discussion of median family income of schools. The income level of the neighborhood in which the school is located has absolutely nothing to do with the number of pupils in the schools located in the neighborhood, but rather with the incomes of the families living in the neighborhood in which the particular schools are located.

Information from the U.S. Bureau of the Census clearly indicates that median family income can in no way be adjusted on the basis of the numbers or percentages of children bussed in and out of school. The questionnaire circulated by the Bureau of the

Census listed the following questions (factors) regarding income for 1969 in the United States. These are the same questions (factors) used in the 1960 Census:

1970 Census

Questions asked of everyone in sample aged 14 and over
(Basis for income data by census tract)

Item 40 -- Earnings in 1969

40a - How much did this person earn in 1969 in wages, salary, commissions, bonuses or tips from all jobs?
This is before deductions for taxes, bonds, dues or other items.

40b - How much did he earn in 1969 from his own non-farm business, professional practice or partnership?
The above is net after business expenses. If business lost money, write "loss" above amount.

40c - How much did he earn in 1969 from his own farm?
This is net after operating expenses. Include earnings as a tenant farmer or sharecropper. If farm lost money, write "loss" above amount.

Item 41 -- Income other than earnings in 1969

41a - How much did this person receive in 1969 from Social Security or Railroad Retirement?

41b - How much did he receive in 1969 from public assistance or welfare payments?
Include Aid to Dependent Children, Old Age Assistance, general assistance, aid to the blind or totally disabled.
Exclude separate payments for hospital or other medical care.

41c - How much did he receive in 1969 from all other sources?
Include interest dividends, veterans' payments, pensions and other regular payments, including net rental income, annuities, unemployment insurance benefits, net royalties, estate and trust funds, private welfare, alimony or child support, foster child care, military family allowances, periodical contributions from persons not living in the household, net gambling gains, non-service scholarships and fellowships.

Source: U.S. Bureau of the Census

Thus it is apparent from the Census questions asked that in order to adjust neighborhood income level by census tracts, one would have to adjust some of the factors listed. School children are not listed and are therefore not an adjustable factor. We assume that the schools located in the poorer neighborhoods accommodate primarily poor children, and that the schools located in the wealthier neighborhoods accommodate primarily wealthy children, but no precise relationship sufficient to "adjust" income levels has been proffered by defendants.

IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF COLUMBIA

JULIUS W. HOBSON, et al., :
Plaintiffs :
v. : Civil Action No. 82-66
CARL F. HANSEN, et al., :
Defendants. :

Affidavit of Stephan Michelson

Stephan Michelson, being duly sworn on oath, deposes and says that he is the senior author of the attached nine chapter analysis of inequities in the Washington, D. C. school system.

He is a Research Associate at the Center for Educational Policy Research, Harvard University; Research Associate at the Center for Law and Education, Harvard University, and Lecturer at the Harvard Graduate School of Education. Prior to his appointment at Harvard, he served in the following positions:

Research Associate, The Brookings Institution
September, 1966 - September, 1968

Instructor of Economics, Reed College
September, 1964 - June, 1966

In addition he has been a Visiting Instructor of Economics at Stanford University, and has been consultant to the U. S. Office of Education, the New York State Department of Education, the National Urban Fellows, The Center for the Study of Public Policy, The Research and Development Center at the Stanford University School of Education, The American Friends Service Committee, and other organizations. He received his B. A. degree with honors from Oberlin College in 1960, his M. A. (Economics) from Stanford University in 1962, and his Ph.D. in Economics from Stanford University in 1968.

John Michael Gray and Eugene Millstein, students at the Harvard Graduate School of Education, have assisted in this work. Gray is a graduate of Exeter College, Oxford University, and Millstein is a graduate of Reed College, with a M.A.T. degree from Harvard Graduate School of Education. Polly Harold (B.A., Newton College of the Sacred Heart) also assisted with calculations, including programming for the IBM 360 computer at Harvard University.

Stephan Michelson
Stephan Michelson

Sworn and subscribed before me this
7th day of December, 1970

Notary Public
District of Columbia

My Commission Expires: June 14, 1975.

Appendix C

A RESEARCH REPORT FOR PLAINTIFFS:

Hobson v. Hansen

Submitted to the United States
District Court for the District
of Columbia as an Appendix to
Plaintiffs' Reply Memorandum,
December 8, 1970

by Stephan Michelson

Assisted by John Michael Gray
Eugene Millstein
Polly Harold

Center for Law and Education
and
Center for Educational Policy Research
Harvard University
Cambridge, Massachusetts

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CHAPTER I

INTRODUCTION

The following document has been prepared for submission to the United States District Court for the District of Columbia, in Civil Action No. 82-66, Julius W. Hobson, et al., Plaintiffs, v. Carl F. Hansen, et al., Defendants. The data employed herein all have been submitted to the Court by the Defendants. In the first two chapters we outline the basic inequities in the Washington, D. C. school system (Chapter II), and our basic disagreements with Defendants' Memorandum of November 17th, 1970 (Chapter III).

The issue is simple: does the District of Columbia school system discriminate in favor of the majority white schools at the expense of the rest of the city? We demonstrate that this is the case. We demonstrate that the Defendants' arguments have been insubstantial and incorrect, and that Plaintiffs' arguments have been correct.

We argue (Chapter IV) that inadequate and incorrect data have been given us, and that some of the methods employed in arguing from that data have been inaccurate and misleading. We present evidence (Chapter V) that the District schools have not taken advantage of the opportunities they have had to distribute students more equitably among schools. We demonstrate (Chapter VI) that economies of scale -- which Defendants claim will justify differential spending among schools of differing size -- cannot explain the expenditure

differentials observed. We examine the variation in teacher expenditure per pupil among schools, and determine how much of that variation is due to differential teacher salaries, and how much to differential pupil-teacher ratios (Chapter VII). We examine the consequences of applying the order to equalize per pupil-teacher expenses within 5 percent of the mean (Chapter VIII), which was the subject of this Court's Show Cause Order of September 1, 1970. We conclude with a summary of findings and recommendations (Chapter IX).

CHAPTER II

BASIC DATA ON THE WASHINGTON, D. C. SCHOOLS

In this chapter we will simply set out some basic calculations which we have performed from the data supplied by the Corporation Counsel to the United States District Court. In later chapters we engage in a comprehensive, detailed analysis of these data. The basic findings will remain substantially as they appear from the argument in this chapter. Schools west of Rock Creek Park are favored at the expense of schools elsewhere. Schools designated as compensatory are similarly favored, and schools in Anacostia are especially disfavored.

A. Inequalities in Expenditures

We consider first the distribution of teacher expenditures among schools. Not questioning who may be the beneficiary, are there schools with per pupil expenditures on teachers well above the average? Not questioning which children are in these schools, are there any schools with per pupil teacher expenditures well below the mean? Because the District recognizes special needs, we will exclude both special schools (schools for the handicapped) and Model Schools from the calculation on p. 4. We arrive at a mean per pupil expenditure on teachers of $497.[*] We ask, first, were there any schools which deviated by as much as 25 percent from this mean? We find the following:

---

[*] Figures are rounded. The mean was $496.81 in fiscal 1971.

SCHOOLS DEVIATING FROM MEAN EXPENDITURE BY MORE THAN 25%

Schools Below	% Below	Schools Above	% Above
Weatherless	55.8	Hyde-Fillmore-Jackson	73.3
Draper	31.5	Janney	54.8
Hendley and Annex	30.9	Lenox and Annex	46.8
Kimball	30.6	Hardy-Key	46.6
Congress Hts. & Annex	29.5	Madison	43.7
Savoy	29.2	Bowen	41.7
Garfield	28.0	Sumner-Stevens	37.2
Ketcham & Annex	25.2	Mann-Stoddert	35.4
		Murch	33.4
		Giddings	30.1
		Merritt	30.0
		Edmonds-Peabody	28.9
		River Terrace	28.8
		Wheatley	26.3

Over 13,000 pupils were in schools with per pupil teacher expenditures above or below the mean by more than 25%. The average pupil in a Model School had an expenditure only 8.2 percent greater than the mean of pupils in non-Model Schools; and of the fifteen Model Schools in fiscal 1971, only six had expenditures more than 25% above the non-Model School mean.* We conclude that there is great variation in per pupil teacher expenditure in the District of Columbia school system. We turn

---

*There are 16 Model Schools, but one of them, Bundy, is a special school.

next, therefore, to the question of which children were in the schools with high, which with low expenditures.

B. Favoritism

We will look at three figures: pupil-teacher ratios, average cost per teacher, and average teacher cost per child, in several areas of the city. These calculations appear in Table II-1, for fiscal year 1970, and in Table II-2 for 1971. Comparisons between areas appear in Table II-3. These tables show that not only are there inequities, and not only do these inequities favor the schools west of Rock Creek Park--but this favoritism increased in the two years considered here. For example, schools west of the park had a pupil-teacher ratio 13.1 percent smaller than schools in Anacostia, in fiscal 1970. In fiscal 1971 the difference is 18.9%. Similarly, schools west of the park received teacher expenditures per pupil which were 31.5% greater than in Anacostia schools in fiscal 1970. In fiscal 1971 the difference is up to 44.1%.*

In Table II-4 we compare the area west of Rock Creek Park to the remainder of the city. Though we compute pupil-teacher ratios differently from the defendants, we concur with their findings reported on page 42 of Defendants' memorandum, November 17, 1970. There they show that the pupil-teacher ratio of schools west of the park is lower than the city-wide average. We find that the same is true, and that the difference is larger in fiscal 1971 than in 1970.

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*Our figures diverge slightly from those offered by defendants. We have made all calculations ourselves, from data supplied by the defendants, and we believe our calculations, at least, to be correct. We have excluded Special Schools from these calculations, as explained below in Chapter 4.

TABLE II-1
ELEMENTARY SCHOOLS[a]
(excluding special schools)[b]
Fiscal '70 (1969 - 1970)[c]

	West of Park	Anacostia	Title I	City-wide
Pupil-teacher ratio	21.27	24.49	21.21	22.67
Average teacher cost	$11,734.39	$10,277.45	$10,160.53	$10,219.70
Teacher expenditures per pupil	$ 551.80	$ 419.58	$ 478.92	$ 450.90

[a] Note: These calculations are based on the data submitted to the Court, labelled "Revised Editions of the Charts Which Were Filed With The Court on November 2, 1970." Data refer to September 21, 1970.

[b] Data were not available for Amidon, Blair-Ludlow-Taylor, Madison, Sumner, Tubman. Leckie is a new school in Fiscal 1971.

[c] Special schools are excluded: Blow-Pierce, Bundy, Grant, Lenox Annex, and Military Road.

TABLE II-2
ELEMENTARY SCHOOLS[a]
Data for Fiscal, '71 (70-71)[b]
(excluding special schools)[c]

	West of Park	Anacostia	Title I[d]	City-wide
Pupil-teacher ratio	19.57	24.12	20.26	22.11
Average teacher cost	$12,580.67	$10,785.90	$11,033.83	$11,079.93
Teacher expenditures per pupil	$ 642.91	$ 446.03	$ 544.67	$ 501.20

[a] See Table II-1

[b] Data were not provided for Blair-Ludlow-Taylor and Hayes.

[c] Special schools excluded were Bundy, Military Road, Blow-Pierce.

[d] We understand that Title I funds for Fiscal 1971 were more concentrated than in Fiscal 1970; for the purposes of these tables we have used the same schools for Fiscal 1971 as for Fiscal 1970 (some Model Schools are Title I schools).

TABLE II-3
DIFFERENCES BETWEEN WEST OF PARK ELEMENTARY SCHOOLS AND ANACOSTIA ELEMENTARY SCHOOLS[a,b,c]

	Fiscal 1970			Fiscal 1971		
	West of Park	Anacostia	Advantage of West of Park	West of Park	Anacostia	Advantage of West of Park
Pupil-teacher ratio	21.27	24.49	13.1% smaller +	19.57	24.12	18.9% smaller
Average teacher cost	$11,734.39	$10,277.45	14.2% greater o	$12,580.00	$10,785.00	16.6% greater
Teacher expenditure per pupil	$ 551.80	$ 419.58	31.5% greater	$ 642.91	$ 446.03	44.1% greater

[a,b,c] See footnotes for Tables II-1 and II-2.

+ The percentage is computed $\frac{24.49 - 21.27}{24.49}$

o The percentage is computed $\frac{11,734.39 - 10,277.45}{10,277.45}$

TABLE II-4
ELEMENTARY SCHOOLS[a, b, c]
(excluding special schools)

Fiscal '70

	West of Park	Remainder of City	West of Park Advantage
Pupil-teacher ratio	21.27	22.73	6.4% smaller
Average teacher cost	$11,734.39	$10,144.13	15.7% greater
Teacher expenditures per pupil	$ 551.80	$ 446.19	23.7% greater

Fiscal '71*

Pupil-teacher ratio	19.57	$ 22.23	12.0% smaller
Average teacher cost	$12,580.67	$ 11,007.05	14.3% greater
Teacher expenditures per pupil	$ 642.91	$ 495.14	29.8% greater

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[a, b, c] See footnotes to Tables II-1 and II-2.

* If model schools are excluded, the West of Park advantage is 13.9% in pupil-teacher ratio; 13.0% in average teacher cost; and 31.3% in teacher expenditures per pupil.

C. Bussing

In Fiscal 1970, 1,702 children were bussed from schools east of the park, largely from overcrowded schools; 1,139 were bussed to schools east of the Park and 563 to schools west of the Park. There are no majority white schools east of the Park,* although two-thirds of the children bussed went to east of Park schools.** Only one-third went to schools west of the Park; not all of these were majority white. Indeed a child bussed in Fiscal 1970 stood only a 19.4% chance of going to a majority white school; in Fiscal 1971 this increased to 23.6%, mostly because fewer children volunteered for bussing to east of Park schools.***

Bussing figures however are only meaningful when compared to the potential number of places available for bussing children into. There were in fact three times as many places in Fiscal 1970 in majority white schools that could have been utilized without threat to the white majority nature of these schools than were utilized.

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*The only exception to this statement is Congress Heights Annex whose status is currently under scrutiny in another portion of the case.

**See Table II-5.

***See Table II-6.

TABLE II-5

Bussing East and West of the Park: Fiscal 1970 and 1971

	West of Park	East of Park	Total	% Bussed West of Park	% Bussed East of Park
Fiscal 1970	563	1139	1702	33.1%	66.9%
Fiscal 1971	548	972	1520	36.5%	63.5%

TABLE II-6

Percentage bussed to majority white schools

	West of Park Majority White	West of Park "other"	East of Park	% going to Majority White schools
Fiscal 1970	330	233	1139	19.4%
Fiscal 1971	359	189	972	23.6%

CHAPTER III

SOME OBSERVATIONS ON DEFENDANTS' MEMORANDUM

On November 17, 1970, Defendants offered their most complete defense to date. We will go through their memorandum and point out a number of errors of fact or interpretation. We do this in varying degrees of detail in this chapter, partly because of the varying importance of the points made, and partly because the next chapters provide more detailed responses to some of these points. The authors of this Report are researchers and educators, not attorneys. Thus this argument constitutes a technical,not a legal response to Defendants' Memorandum.

Two kinds of points will be made here. One is methodological. We take serious exception to the kinds of arguments presented. Especially, we object to the use of hypothetical examples to illustrate points about the D.C. school system which can be analyzed directly. We will mention several examples of hypothetical argument. The other major point concerns irrelevant arguments. By stating correct facts in the context of an argument which is not at issue in the case, defendants obscure the underlying questions being asked. We will attempt to point out instances of this type of argument.

A. On Explaining a Phenomenon

There is an unfortunate tendency to assert that "X produces Y" or "X is the major factor in producing Y" without giving an analysis which leads to that conclusion. We will briefly look at this problem with respect to the decline in over-capacity, the decline in the over-all

pupil-teacher ratio, the decline in bussing, economics of scale, and an argument about teacher quality. In the second case, we will also see an example of an irrelevant argument, in the third, an example of no assertion of major cause when one is called for, and in the last, a hypothetical argument where an empirical one is required.

1. The Over-Capacity Problem

Defendants claim:

> The most important factor leading to the elimination of over-crowding has been the Capital Outlay Program. [p. 4]*

In the first place, the overcrowding problem has not been eliminated. We find thirteen schools still listed, in October 21, 1970, as being overcrowded by the 30 pupils per regular classroom standard. If the current 24-1 standard were used, the number of overcrowded schools would be larger.

Secondly, there have been two other factors at work in reducing overcrowding: bussing and decline in school population. Overall, 5,365 fewer children attend the D.C. public elementary schools in fiscal 1971 than in fiscal 1968.** Yet in fiscal 1968, the schools were only 5,500 children over capacity. Thus population decline alone account for all but 135 children - i.e., reduced the overcrowding by 97.5 percent! The seats released by this reduction in overcrowding could have been matched with children by bussing.

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*Rather than footnote each reference to Defendants' Memorandum of November 17, we will indicate the page reference in brackets directly below the quotation.

**From defendants' figures on p. 4 of November 17 Memorandum.

Taking the Capital Outlay and the natural reduction figures as they are, however, we find a total reduction in crowding of 24,693 (the 5,500 crowding in 1968 plus the 19,163 surplus capacity in 1971), of which the natural decline in population accounted for 21.7 percent. Thus it can be said that the Capital Outlay Program is the most important factor in explaining the change from net crowding to net excess capacity position of the schools; but it cannot be said that this program was necessary, or would have been important under other policies, given the natural decline in pupil enrollment. For more details on the bussing and building issue, see Chapter V.

2. The Pupil-Teacher Ratio

> Three years ago, at the 30 to 1 ratio, there was a shortage of about 5,500 seats. This fall, using the same standard of 30 students to a classroom and including seats in demountables, there is a surplus of 19,193 seats. By effective utilization of this additional space, the defendants have succeeded in reducing the city-wide average pupil-teacher ratio to 20.9-1.
> [p.6, emphasis in original]

This statement is a compounded non-sequitur. In the first place, reducing the overall overcrowding says nothing about the distribution of overcrowding. We will show, in Chapter V, that there are a great many spare seats in some parts of the city, and that bussing is deliberately passing these schools by, despite 1) apparent parental preference for these schools as receiving schools, 2) geographic feasibility of bussing to these schools from presently overcrowded schools, and 3) the current bussing of pupils to schools with higher capacity utilization.

Secondly, the city-wide pupil-teacher ratio could be reduced without

any change in overcapacity in schools. This ratio does not depend on capacity, but only on the number of pupils and teachers. Classes in auditoriums, cafeterias, etc. - the expediency of the overcrowded school - have teachers. In addition, the distribution of the pupil-teacher ratio is the important issue here. Bussing is a way to equalize pupil-teacher ratios. Indeed, defendants' arguments that there is an enforced low pupil-teacher ratio in some circumstances fails to see a possible solution: bus children into or out of the school, thus allowing a more equal teacher-pupil ratio.*

3. Reduction in Bussing

> For a number of reasons the volunteer bussing program this year has not been as successful as in the past. [p. 13]

No attempt is made in this statement to assess the importance of the various reasons offered. From the data presented to us, we show that reason number 4, "The educational program is not that much better in the receiving school" (as perceived by parents) may well be the most important factor in the bussing decline. We also offer evidence that this is because those schools which would be perceived as superior are apparently not offered as alternatives. This analysis appears in Chapter V.

Presentation of "evidence" in the form of a list of reasons presumably given by parents strikes us as peculiar. Most importantly, again, no attempt is made to explain the phenomenon of the decline in bussing.

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*Defendants' Memorandum, p. 23, where the example is given of a grade with 34 children, who are shared by two teachers for a 17-1 pupil teacher ratio.

There are two sides to this story: the conditions of the offer to bus as well as the parents' desire to bus. An article by Aaron Latham in The Washington Post indicates that the parents may well desire bussing, and therefore this decline does require explanation.*

4. Economies of Scale

Defendants assert that size, and size alone, determines the variation in per pupil expenditures which plaintiffs have demonstrated.

> The Defendants must here again emphasize that it is not the blackness or whiteness of the school, nor the poorness or richness of the school that causes a high or low per pupil expenditure figure. It is the size of the school. [p. 23]

However nowhere do they show how much of the variation in expenditures among schools can be attributable to variation in size of school. More importantly, nowhere do they investigate how much of this variation in expenditures should be considered explainable by size.

We investigate this question thoroughly in Chapter VI. We show there that size can explain, at the very most, less than one-third of the variation in teacher expenditures per pupil. Furthermore, we demonstrate that size uniquely explains only 7.5% of the variation in teacher expenditure.** Lastly, this calculation was made without benefit of teacher experience data, which, if it is at all correlated with size of school, will share some explanatory power with size, and thus reduce the

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*Aaron Latham, "D.C. Bussing: Both Races Gain," The Washington Post, April 26, 1970.

**Variation of expenditures explainable by any variable has two components: that which the variable explains, but so do other variables, and that which the variables explain which other variables do not. This latter part is called the "unique" explanation. See Chapter VI for more discussion and references on this point.

unique explanation of size even further. Defendants' assertion that variation in size of school accounts for variation in expenditures is unfounded.

5. Teacher Quality

Defendants offer a number of arguments concerning the factors which would define a "quality" teacher. We will return to this discussion later. Here, we will point out one aspect of the argument.

> Another factor is that teacher compensation in the District relative to surrounding areas may have changed over time. Surely this would be reflected in the excellence of the teachers who have stayed, relative to those who have left, as well as the individual qualifications of teachers who entered the system at different times. [p. 32]

This argument is purely hypothetical. Relative compensation "may have changed" and "surely" there would be some effect if it had. If defendants are to make this argument, they should at least show that relative compensation _has_ changed. However, racial composition of schools has also changed, and there is evidence that this factor is at least as strong, if not stronger than salary, in determining the supply of teachers to schools.* Thus even if relative salaries have changed in favor of the District - which we do not know - the results might not show in relative teacher quality, because other factors have changed also. It might be

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*See, for example, John Owen, "An Analysis of the Inequality of Educational Expenditures in Large American Cities," Johns Hopkins University (typescript, October 1969). Some of the results reported there are available in John Owen, "Inequality and Discrimination in the Public School System: Some Empirical Evidence," in David Mermelstein, editor, _Economics: Mainstream Readings and Radical Critiques_, Random House, 1970, pp. 137-145. See also Henry M. Levin, _Recruiting Teachers for Large-City Schools_, Charles E. Merrill, 1970.

mentioned that the argument is so hypothetical that the defendants never do commit themselves to the *direction* of change they wish to show. It is quite as likely, even accepting their incorrect hypothetical argument, that the implication is that the quality of new teachers to the D.C. system has *declined*, so that older teachers might be better than new ones.*

B. On Errors in Calculations

Anyone can make an error, and we will not harp here on calculation errors. We will merely note one, comment on what defendants take to be an error of the court, and refer to an error in plotting and interpreting points on a scatter diagram.

1. Model Schools

We do not understand why defendants list Model Schools data on page 21. They are attempting to demonstrate that an average pupil in a Model School has more money spent on him than an average pupil in the city at large. This appears to be correct. This program was designed as compensatory, and is not bound by the 5% equalization rule proposed here. We will note that the calculation of the total Model Schools expenditure was in error:**

change $6,618,441.61 to $6,619,441.61

and change the consequent average to $677.45. Excluding Bundy, which is a special school, the average is $651.28.

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*Of course a further complication is whether the old teachers represent the average teacher quality of all those teachers who entered the system with the old teachers. If they do not, then did the better or the worse teachers remain? If the better ones remained, then even if the new teachers are better on the average than new teachers used to be, they still may be inferior to old teachers.

**We are assuming that the data list is correct.

2. "True" Averages

Defendants note in a footnote, page 19, that "the true average expenditures for pupils attending elementary schools west of Rock Creek Park is $713, not $754 as the Court suggests." Defendants go on to point out that the Court's average was obtained by dividing the per pupil expenditures for each school by the number of schools, not the total expenditures per school by the total number of children. It is true that, to compare with the average per pupil expenditure over all pupils, this is the relevant calculation.

It is not true that the average of per pupil expenditures *over schools* is in any other way either incorrect or uninteresting. Indeed, this case is about *schools*, and therefore one might very well be interested in the per school average pupil expenditures. Our analysis in Chapters VI and VII will deal with schools as the relevant units of observation. Our equations will be based, therefore, on the means as defined by the Court, not as defined by defendants.

3. Scatter Diagrams

Defendants offer a number of scatter diagrams and explain them beginning on page 35. In Chapter VII we will show that there are peculiarities in these plots - some schools combined, some not - which could be called errors. A more important error is the misinterpretation of the 5% equalization rule. Under this rule, the average would be taken without Special and compensatory schools, and these schools would not be bound by the 5% limits.

It is also true that in each instance defendants' plots do not correct for any factors. In a complex issue such as this, it is often the case that important factors are not apparent, and apparent factors are not important. To show "zero order" - i.e., uncontrolled - relationships may be a reasonable first investigatory step, but it does not suffice to demonstrate important technical points.

An example of loose usage of technical terms appears in this connection. On page 37 defendants say "There appears to be no significant relation between these factors," and 'No significant relation between income and teachers' academic preparation appears." Statistical significance is not a matter of appearance, but of rigorous method. For reasons discussed in Chapter IV we have not pursued the question of whether there are "really" significant relationships where defendants say there "appear" to be none. However, our rigorous findings in Chapters VI and VII will give significance levels and some discussion of the relevant determination of statistical significance. The analysis there will deal with controlled situations in which relationships are isolated after holding constant factors which tend to disguise them.

C. On Teacher Characteristics

Defendants mount two arguments that teacher experience, the major factor in differentiating teacher pay, should not be counted in calculating expenditure differences among schools. The first argument is that the Guidelines for Title I of the Elementary and Secondary Education Act exclude longevity pay in determining inter-school comparability. The second argument is that teacher experience has not been found to be important

in studies of teacher quality. We reject both arguments.

1. Longevity Pay and Title I

The senior author of this Report was a consultant to the Title I Task Force which wrote the new guidelines, and was present in Washington at the comparability conference which considered the problem of longevity pay. The issue was strictly political, and its resolution was strictly political. We asked school representatives repeatedly why they paid for experience which they were claiming to be valueless. They gave no satisfactory response, from our point of view, and that question remains the major one of this issue. Nonetheless, Guidelines operate only if school personnel agree with them. Title I funds are effectively coordinated at the state level, it being impossible for the federal government to monitor the more than 20,000 Title I school districts. State personnel have to maintain close working relationships with local Title I coordinators. The idea is to get the money into the schools, not make the administration of the money so difficult as to block the flow of funds. Pressure from local school districts to avoid actually equalizing schools lies behind the longevity exemption.

The method employed by the District of Columbia (and presumably other districts)to adjust for longevity pay _in fact corrects too much_. Administering this provision of the Title I Guidelines will be seen, eventually, to be extremely difficult. Given the history of changes in these Guidelines, we think the particular rule in force at a particular time should have no special influence on the court. When the error in the application of the rule is understood, then either the rule or the calculation

will be changed. On the grounds that these Guidelines are a temporary political expedient, not an eventual solution, we urge that the court deny the exemption of longevity pay from the equalization formula for District schools.

The calculation problem is this: the teacher salary schedule forms a matrix. The rows represent degree status, and the columns represent years of experience.

		1	2	3	4	5	6	7	8	9	10+
a	B.A. or B.S.										
b	Bachelors + 15 credit hours										
c	Masters Degree										
d	Masters + 30 hours							X_{d7}			
e	Doctorate										

A particular salary is a dollar figure, shown for example as X_{d7} which in this example is $11,380.* The formula for calculating "adjusted" teacher salaries is to assign to each teacher the value in the first column of whatever row that teacher is in. The teacher with X_{d7} salary will be assigned X_{d1} salary which is, say, $8,970. Our claim is that the difference between X_{d7} and X_{d1} (in this example, $2,410) overstates the amount by which the teacher was rewarded for experience alone.

Conceptually, one becomes a row d column 7 teacher by starting at row a, column 1, and adding qualifications to that base pay. Here the base pay is $7,800. If the teacher with no degree has seven years of experience, the salary will be $9,760. However, the salary for the new

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*These figures are not hypothetical. They come from the current District of Columbia salary schedule, where years here are called "Service Steps" in that schedule.

teacher with a Masters degree and 30 hours is \$8,970. These figures are placed as follows on the salary schedule:

X_{a1} = \$7,800 X_{a7} = \$9,760

X_{d1} = \$8,970 X_{d7} = \$11,380

The difference between the seventh and first years for row a, the Bachelor's degree only, is \$1,960, but the difference for the Master's degree plus 30 credit hours - row d - is \$2,410. Thus of the \$2,410 subtracted from the teacher's pay as a correction for longevity (bringing him to X_{d1}), \$450 or 18.67% is not strictly attributable to longevity. It is a longevity increment only for those with Master's plus 30 credits, and therefore is equally a bonus payment for the degree status as for the experience.

The problem here can be expressed algebraically. The route from X_{a1} to X_{d7} has two parts. Consider the final result the product of these two parts. First, X_{a1} is the product of Experience and Degree:

$$X_{a1} = (\text{Exper}_1)(\text{Degree}_a)$$

Now X_{d7} is the result of having incremented both factors.

$$X_{d7} = (\text{Exper}_1 + \text{more Exper})(\text{Degree}_a + \text{more Degree})$$

and multiplying this out we get

$$X_{d7} = (\text{Exper}_1)(\text{Degree}_a) + (\text{Exper}_1)(\text{more Degree}) + (\text{more Exper})(\text{Degree}_a) + (\text{more Exper})(\text{more Degree})$$

X_{d7} is therefore composed of, in order, the initial salary for no experience and minimum degree, the increment due to an advanced degree, the increment due to experience, and the increment due to both more degree

and more experience. The correction back to column 1 implicitly assumes that all of this interaction is attributable to experience alone, though this is simply not true.

Thus we argue that even if one were to allow a correction for experience, defendants have corrected too much in their calculations. But more importantly, we assert that this issue will become clear to Title I administrators, it will be even more serious with other salary schedules, and some adjustment will have to be made in the longevity exemption of the Guidelines. Furthermore, as we have stated, as long as the school district values experienced teachers highly, we see no logic in attempting to impose some other set of values on them. A school district which wants to value teachers in other ways - as, for example, the Clark plan in the District of Columbia would do - should be quite free to do so. All we ask is that equal quality be provided for all children, where quality is defined by the school district itself, not by politically based employees of the federal government.

2. Experience as a Factor of Production

Defendants argue that experience pay should not be counted when equalization questions are raised because experience has not been shown to be "productive" in terms of student achievement. They do not mention that degree status has not fared as well in statistical tests. In actual fact, experience of teachers consistently shows a positive relationship with achievement test scores, both within and between cities. The defendants cite two works with which the present senior author has been involved.*

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*J.W. Guthrie, G.B. Kleindorfer, H.M. Levin and R.T. Stout, Schools and Inequality (The Urban Coalition, 1969), and Henry M. Levin, "A Cost-Effectiveness Analysis of Teacher Selection" (Journal of Human Resources, Winter, 1970).

In work which Henry Levin and Michelson are jointly pursuing, every attempt is made to minimize the effect of teacher experience. This is because that effect is, no doubt, biased upwards by the mechanism to which defendants refer on page 29: teachers selecting the higher achieving students. However, neither these researchers nor defendants have demonstrated that this bias is great enough to reduce the real effect of experience to zero.

Levin's cost-effectiveness analysis makes no such claim. His results are that school systems seem to be paying too much for experience, not that they should pay nothing. This kind of research is directed at school management, to urge them to re-evaluate their concepts of "quality." It is not clear to us that such advice constitutes grounds for judicial intervention.

In more detailed analysis, Levin found that experience and effectiveness did seem to be related, and in the way one would expect: the first few years have great advantage, and then the increment in teacher effectiveness from more experience diminishes. Levin never does get a negative result; that is, experience never is detrimental to producing achievement in students.* In separate articles printed together, Levin and Michelson present probably the most elaborate statistical work yet produced on the question of isolating effective school characteristics.** In slightly

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*It should be noted that achievement test results are the only outcomes of schooling measured in these studies. No researcher considers these the only desirable outcomes of schooling, and no researcher would suggest that policy be based only on results of test scores. See Henry M. Levin, Recruiting Teachers for Large-City Schools, op. cit.

**Henry M. Levin, "A New Model of School Effectiveness," and Stephan Michelson, "The Association of Teacher Resources With Children's Characteristics," both in Do Teachers Make a Difference?, U.S. Office of Education, OE-58042, 1970.

different simultaneous equations estimations on the same data these authors find considerable effect of teacher experience in producing sixth grade verbal achievement. Once again, these estimates are biased upwards, but we do not know how much. Not even the most ardent anti-octagenerian has claimed that the first few years of teaching experience is valueless.

Defendants' appeal to the literature, in short, does not aid their argument. Researchers consistently find some relationship between experience and achievement, though not as great a one as is paid for. Defendants would have to argue that the error caused by not adjusting is greater than the error caused by adjusting. It is just not as easy as saying "experience has no value, adjust away all pay for experience." And in the end there is still the argument: let the school system pay for whatever it wants to, only distribute resources as they are valued by the school district equally among all the children.*

D. Judging the Validity of Arguments

We will consider three issues in this last section. First, the question of judging schools. Defendants would apparently leave us no criterion for judgment. Second, we will comment on defendants' stress on the number of pupils who would "lose" from an equalization directive. Third, we will discuss the alleged incompatibility between a 5% equalization plan and the Clark plan.

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*We note that in defendants' own example, on page 33, the teacher with five years experience - not the neophyte - is contrasted with teachers of 20 years experience in another hypothetical example with no known connection to any school. Defendants perhaps feel that the 20 years experienced teacher will be preferred to the no experienced teachers should they give that stark an example. They are implying, therefore, that some experience is valuable.

1. How Do We Judge Schools?

> The public school system of the District of Columbia is an organic school system. ... In short, it is a school system that is trying to meet the daily changing demands of nearly 90,000 elementary school pupils rather than trying to achieve some artificial meaningless symmetry of expenditure figures. [p. 20]

The question is, if we cannot judge the intent of the management of the school system from the results, what can we judge it by? We show, in Chapter VI, that achievement test scores are far higher in schools west of Rock Creek Park than in schools east of the Park. There is some evidence that this results at least to some extent from the schools: Children who were bussed to these schools performed better than they had previously performed, relative to their grade.* Thus we have some reason to believe that these schools are better achievement producers than other schools in the system. In addition, more money is spent in these schools, on the average, than in the other schools. Yet we are told that this is the result of an "organic" system, that the managers are managing with good intentions for all. This may be so. But if they will agree that we should judge their management, they should cooperate to give us the tools to do so. They argue here that we should not look at equality of resource flow into the school (as they measure resources, with dollars). What is left?

Furthermore, they do seem to want to be judged in this way. They calculate the teacher expenditure for needy children - assuming that needy children in fact receive the average expenditure of the school they are in, and counting needy children in special schools. We have not

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*See Aaron Latham, "D.C. Bussing: Both Races Gain," op. cit.

calculated a corrected figure (i.e., excluding special schools), because it is not relevant. If the children in schools west of Rock Creek Park receive above average resources, then the fact that needy children receive average resources is hardly a rebuttal. It does indicate that defendants are willing to argue that equalization is not meaningful, but that they deserve praise when they achieve it.

2. Equalization and Children

Defendants estimate [p. 27] that over 13,000 needy lunch children will lose resources under an equalization plan.* Defendants do not point out that, by their method of calculation, over 14,000 needy pupils would gain. However, this is not a relevant argument. Pupils who now have extra resources should not have them, be they poor or rich. Why does the school system value those 13,000 children who now receive extra resources over and above the more than 14,000 - though the number does not matter - who now are far below average?

The calculation is in error, however. It assumes that the system-wide mean was calculated, and all schools were compared to it. In fact, the formula would exempt special and compensatory schools. For example, it might exempt the Model Schools, eight of which (with 2685 needy children) would remain more than 5% above the mean. Thus our arguments are 1) fewer children are affected than defendant implies, 2) those needy children who had been favored would indeed lose resources, 3) those needy children

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*This calculation was made on the basis of faulty data, as well as by faulty methods outlined in the text. The revised data show fewer needy students "losing".

who had been disfavored (and, for what it is worth, there are more of them) would gain resources, and 4) non-needy children who are favored, particularly those in schools west of Rock Creek Park, would lose resources. These are plaintiffs' goals.

3. Equalization and The Clark Plan

Defendants argue that imposition of an equalization plan would conflict with the Academic Achievement Project, commonly known as "The Clark Plan" after Dr. Kenneth Clark, its originator. We argue 1) that there is no Clark plan, for all practical purposes, 2) that if a reading concentration program is activated, it will not contain the provision for productivity pay for teachers, and 3) that if the Clark plan is instituted with productivity pay, it will not be affected by a court equalization order. In fact, we will argue, the plan and an equalization order are natural allies, not at all incompatible with each other.

The first two points are a matter of current history.* Other than a move to release test scores, there has been no action towards instituting the Reading Year, and bonus pay for teachers seems certain not to be included in such a plan should it ever be introduced into the schools.

The question of incompatability between the Clark Plan and equalization is probably not important practically. However, defendants assert

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*See, for example, "'72 D.C. School Budget May Mean Larger Classes and Fewer Electives," Peter Milius, The Washington Post, November 10, 1970, for a look at the budgetary problems which underlie all attempts to vitalize the D.C. schools. For evidence more directly on the Clark Plan, see "Scott to List D.C. Pupils' Test Scores," Lawrence Feinberg, The Washington Post, November 18, 1970. For a view of the rift in the school board which the Clark Plan has accentuated, see "Anita Ford Allen ... black like me" by George N. Allen, The Washingtonian, September, 1970.

that they are incompatible in conception, quoting from an article by Robert W. Hartman.* Hartman seems to believe in the outcome of competition, no matter how severe the loss is to the loser, or the circumstances surrounding losing. Thus a school which is manned by "losers" (teachers who do not make bonus pay) is not adjusted. It competes. A child entering such a school has no appeal to a regulatory body. He cannot, in Hartman's view of the scheme, ask for an equal chance at the good teachers.

The Clark plan, however, as Hartman fully discloses, rewards the teacher, not the school. It identifies the good teacher, or else it is not working properly. If in year 1 a certain school has more than its share of good teachers, what might a regulatory agency, caring for equality among students, do? It might lower the pupil-teacher ratio in the school with the poorer teachers, thus compensating the children in these schools, bringing the schools to near comparable expenditures. This would in no way counteract the Clark plan of incentive payments to teachers.

The regulatory agency could also redistribute the best teachers. Defendants attempt to show, as we have seen, that the most experienced teachers are not the best. They do this because many experienced teachers are in schools west of Rock Creek Park. Suppose we could unequivocally identify the best teachers and suppose we found them concentrated west of the Park? Does the concept that we redistribute these teachers (and consequently expenditures) evenly throughout the school system strike defendants as "unfair"?

There are, then, two ways to compensate poorly performing schools, without destroying the incentives to teachers. One is to compensate the

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*Robert W. Hartman, "Two Major School Plans May Be Incompatible," The Washington Post, September 13, 1970.

child in the poor school for not having equivalent quality teachers, by having more teachers (or other materials). The other is to assure that all children have equal access to the acknowledged best teachers. In theory this could be achieved by moving either students or teachers.* In practice it must be done by moving teachers. There is no doubt about the school department's right to assign a teacher to a school. However, if in practice teachers do not react well to this kind of policy, the compensatory policy is still viable.

We cannot see why Hartman and the defendants find these two plans irreconcilable. In his analogy to the market place, Hartman ignored a basic premise under which markets actually operate: consumer protection. All markets are regulated to some extent, by basic laws which attempt to give all consumers an equal chance. When there are local monopolies - i.e., when a buyer (student) is supplied by only one seller (the neighborhood school) - we recognize the duty of government to more than just protect against fraud. We actively regulate the activities of the seller. In this case, under the principle of equal protection, we would regulate schools so as to give each child an equal chance at resources as defined by the school district. This is the basis of school equalization, and it is compatible with redefining the criterion of teacher "quality", which is essentially all the Clark plan does.

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*For example, one could envision a lottery in which each student was randomly assigned a number each year, and he chose in his turn which school to attend. Transportation problems, of course, bring such a theoretical alternative completely out of the range of possibility, in the context of the public school system as presently constituted. See, however, *Education Vouchers*, Center for the Study of Public Policy, 1970, for a discussion of such a solution based on *equal expenditures per pupil* (with exception only for compensatory education).

CHAPTER IV

SOME GENERAL ARGUMENTS CONCERNING DATA AND METHODS

In this chapter we will attempt briefly to explain some of the difficulties we have had with the data submitted by the defendants, and with the procedures they have employed to argue their case. This is not a complete list of our problems--we will mention others when the need arises. However, the frequency of poor, misleading, or simply inaccurate data presentations is too great to make reference to only in passing footnotes.

A. The Need for Consistent Data

We will discuss two examples in this case which highlight the need for consistent data reporting: data on children receiving free lunch, per school, and new data on enrollment and pupil-teacher ratios.

1. Needy Lunch Children

The number of children per school recieving free lunches is submitted by defendants, starting on page 23 of Defendants' Memorandum of November 17.

> This measure may be superior to the data on family income in the census tract of the school for 1959 because it is more timely and because it depicts the income of the families of the pupils attending the school rather than the income of the school's neighborhood at large.

However, the intent of this submission is not to replace the 1959 census tract data, but to resuscitate it. Several of the scatter diagrams which they employ in their argument are based on these data.

In defendants' submission to the court on August 21, 1970, they claimed that rank-order correlation was "appropriate to the comparison of two ranked listings," and they calculated a rank order correlation between 1959 income and per pupil expenditure of -.08. "This indicates that no relationship exists between the variables under consideration, i.e., the per-pupil expenditure by the District of Columbia Public School System, at any specified school building is independent of the median family income in its neighborhood."

The correlation is meaningless, however, as defendants claimed in their next paragraph, which we reproduce in full:

> Inasmuch as the data on per pupil expenditures and those of family income are based on information collected ten years apart, it is difficult to make any meaningful interpretation of the figures. The foregoing conclusion is valid only if the same pattern of family income exists in 1970 as was evident in 1960. Although statistical data are not yet available from the Bureau of the Census, it is manifest that, in a substantial number of instances, the economic level in census tracts on the periphery of the central core of the city has changed materially.

We have been unable, in the time since the defendants' submission arrived, to correlate this lunch data with the 1959 income data. Defendants produce a grouped correlation, that is, a relationship between schools grouped by income level and the percent of needy children per group. We will demonstrate below, in discussing defendants' "economies of scale" argument, that a perfect grouped correlation may be derived from a weak correlation in the data. We will demonstrate also that some individual correlation may be spurious. We simply

do not have the facilities to check arguments using new data so quickly, and suggest that if arguments are to proceed on new data, those data should be submitted at least two weeks before the argument is made.[*]

However, let us deal with this attempt to resuscitate the 1959 income data, after it had been declared dead by the defendants themselves. In a rank correlation, items are lined up in order according to one criterion--1959 income--and assigned a rank according to their place in line. They are then ordered by another criterion--expenditure per pupil--and assigned ranks in that line. Then the difference between ranks is measured. The amount by which one school's income or expenditure is greater than another is not considered as "information" in this calculation. Thus school expenditures might be:

School A	$1,000
School B	985
School C	800

The difference between School B and School C is over twelve times that between School A and School B, yet in a rank correlation the difference is one place.

Since the court order asked for "a statistical correlation" between 1959 income and expenditures, and since these are cardinally valued (not just ordered) items, one would ordinarily perform a Pearson product-moment

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[*] This has proved to be a fortuitous inadequacy, as defendants notified us by telephone on November 25 that some of these figures were incorrect. We received written corrections on November 27; however these did not always agree with those given us by telephone, and included revisions not previously mentioned! We feel somewhat paralyzed in our attempt to analyze defendants' data, fearing that they will be revised at any moment.

correlation on these data. Doing this, we find that the correlation between per pupil expenditures in fiscal 1970 and 1959 income is in fact +.053; small, but positive. The correlation between per pupil teacher expenditures in fiscal 1970 and 1959 income (before bussing) is .100, and this is statistically significant. If defendants really wish to revive this data, they will have to live with it.

This correlation, though probably significant, is nonetheless not large. Nor should we expect it to be: zero-order correlations (i.e., correlations uncontrolled for other factors) have no place in a case such as this. For example, when we exclude Special Schools, as a control, the correlation between teacher expenditures and 1959 income rises to .172![*] So we are not sure if defendants wish to use these 1959 data or not. They do not seem favorable to their case.[**]

More importantly, if we are to believe both the 1959 income data and the free lunch data, then it is clear that the children who are bussed to schools west of Rock Creek Park are among the most affluent in their neighborhoods. The percentage of "needy" children is exaggerated with respect to Social Security Administration poverty guidelines. The document reproduced on page 24 of Defendants' November 17 Memorandum shows that a family of four is eligible for free lunches if its income is $4650 or less. The poverty threshhold for

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[*] Calculated for 123 schools in fiscal 1970. A list of schools omitted from the data, with reasons, appears below on p. 112.

[**] We will discuss the relevance of correlation techniques to the argument before the court below in this chapter. The analysis submitted to the Court concurrently with this document, by Julius Hobson, also demonstrates the inadequacy of this kind of correlation in dealing with the issues of this case.

1969, for a non-farm family of four, was $3743. Thus, families are still considered "needy" in terms of school lunch with $907 more income, or 24 percent more income than the ordinary poverty guidelines.* We would expect, therefore, that the reporting of "needy" children from the school lunch program will overstate the percentage of poor as ordinarily calculated. If these data are accurate, and if they show a small percentage of poor in west of Rock Creek Park schools, then, since they are biased upwards, the actual percentage of poor children must be even lower.

Fiscal 1971**

Percent "needy" west of Park of total enrollment
in West of Park schools = 5.1%

Percent "needy" east of Park of total enrollment
in East of Park Schools = 37.8%

This raises serious questions about the school's bussing program, to which we address ourselves below in our discussion of that program. It raises equally serious questions about the propriety of calculating adjusted school 1959 income using the mean income of the neighborhood from which children are bussed, when clearly higher than average income children are in fact bussed. Detailed tables on this subject will appear in Chapter V.

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*See U. S. Department of Commerce, "Selected Characteristics of Persons and Families, March, 1970," Current Population Reports P-20, No. 204.

**Calculated from enrollment data submitted with Defendants' Memorandum of Nov. 17, and free lunch data as revised November 27,1970.

Here we present our calculation of the percent of needy children in schools west of the park, compared to the percent which could have been in these schools given the number of children bussed to these schools. We will detail in Chapter V what percentage of needy children could have been bussed to these schools under a diligent program. For now we are merely demonstrating that if one is to accept defendants' argument that we can tell how many needy children were in each school, then the bussing program must have "creamed" children of higher income than that of their sending school neighborhoods.*

Fiscal 1971

School	Number bussed	Needy	Percent needy
Eaton	41	24	58.5
Fillmore	66	17	25.8
Hardy	78	12	15.4
Hearst	44	17	38.6
Hyde	45	15	33.3
Jackson	66	19	28.8
Janney	79	16	20.2
Key	68	23	33.8
Mann	43	17	39.5
Murch	18	10	55.5
	548	170	31.0

In the above calculations we are assuming that all needy children were bussed into each school. This assumption biases the figures against our argument, for the more needy children in a school before bussing, the lower must be the percent needy of the total bussing program. The 31% figure, therefore, is the highest possible estimate of the number of children bussed to schools west of the Park who are needy.

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* The proper comparison, of course, would be with the percent needy in the sending schools. Since the city-wide percent needy is 38.1, as given in defendants' November 27 submission, we assume the sending schools have at least that percentage needy.

The last argument about the late submission of the free lunch data, and dependants' reliance on it, is that these figures are probably inaccurate indicators of poverty anyway. Defendants argue that a good data source would be "the number of pupils who qualify for free lunches in each school."[*] The data they submit is on the number of children "participating in the free lunch program."[**] A Committee of the U.S. Senate found evidence in 1970 that many children who qualify for this program do not participate in it.

Charles V. Daly: "After 24 years, this nation's school lunch program reaches 20 million children; however, it feeds only 3 million of the 8 million most in need.[***] Dr. Arnold E. Shaefer: "It's obvious that our feeding programs have been damned ineffective."[****] "Dr. Jean Mayer said two-thirds of America's indigent children are not reached by the school lunch program."[*****]

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[*] Defendants' Memorandum, p. 23, emphasis added.

[**] Ibid., p. 25, emphasis added.

[***] Forward to "Why Child Nutrition Programs Fail" by Rodney E. Leonard, reprinted in Hearings before the Select Committee on Nutrition and Human Needs of the U.S. Senate, 91st Congress, 2nd Session, Part 2 (1970), p. 518. Daly is President of the Children's Foundation

[****] Dr. Shaefer is director of the National Nutrition Strategy Program of the U.S. Department of Health, Education and Welfare. This quotation comes from an article in the Washington Post, April 28, 1970, reprinted in Hearings, op. cit., p. 516.

[*****] Dr. Mayer was President Nixon's special advisor on health needs. Quotation from the Modesto (California) Bee, September 11, 1969; reprinted in Hearings, op cit., p. 503.

Neil Bodine:[*] "Finally, the current administration of the free-lunch program in the Modesto City Schools seems to be totally inconsistent because the income of the majority of the families that were turned down for the food program relative to the number of school age children in their families is as low or lower than that of the families that are receiving free lunches, and if you study the two tables here you can see that actually the ones that are refused do not even have as much money as those that are presently being served."

James Hemphill and Senator George McGovern entered into the following exchange:[**]

> Mr. Hemphill: A minimum of 500,000 children in California should be receiving free and reduced-price school meals.
>
> Senator McGovern: Now, how many of those, was it 500,000, how many of those are you presently feeding?
>
> Mr. Hemphill: In January, 175,000.
>
> Senator McGovern: Mr. Hemphill seems to me to have placed his finger on the crux of the problem here in California, that roughly two-thirds of the children from poverty-level families in this State do not participate in a school lunch program of any kind.

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[*] Mr. Bodine is Executive Director of the Stanislaus County Community Action Commission. Hearings, p. 339.

[**] Mr. Hemphill is Supervisor of Food Services, Department of Education, State of California. Hearings, pp. 343 and 347.

We seriously question defendants' utilization of data of known poor quality to justify utilizing another data set of previously admitted irrelevance. We have shown, however, that use of either set of data would strengthen plaintiff's case.

2. New Enrollment and Teacher-Pupil Ratios

Accompanying their November 17, 1970 Memorandum defendants presented several bodies of data. One gives the pupil-teacher ratio for each school. These figures are based on enrollments and teacher counts from September 21, 1970. However, defendants tell us not to use these data, because "Preliminary figures for October 22, 1970 indicate a decrease in the range of pupil-teacher ratios." They also tell us that "although popular agreement would probably have it that low pupil-teacher ratios are advantageous, test results are ambiguous.[*] Previously they had assured us that "reduction of overcrowding has produced rich benefits; the primary one is the reduction in teacher-pupil (sic) ratios, which maximizes opportunities for optimum teaching and learning."[**]

The new data on pupil-teacher ratios are not acceptable anyway. "Teacher count include [sic] counselors and librarians, special teachers, and special subject teachers. Teachers of the retarded and handicapped and corresponding

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[*] Defendants' Memorandum of November 17, p. 30.

[**] Supplemental Affidavit of Benjamin Henley, August 12, 1970, p. 5.

special class enrollments were omitted."[*] We are not sure what it means to say that special teachers are included but teachers of the retarded and handicapped are omitted. We are especially not sure what this implies about Bundy, Blow-Pierce, and Military Road schools, which (except Blow) are special--and, we had thought, for the mentally retarded or physically handicapped.

The basic problem with these data, however, is in the inclusion of non-teachers. We have never before encountered a pupil-teacher ratio which included counselors and librarians. If the ratios of librarians to teachers, special subject teachers (who, we assume, do not have regular classrooms) to regular teachers, etc. is not constant among schools, then this figure cannot be interpreted. Certainly, the level of these figures is artificially lowered by the inclusion of special personnel. These ratios are surely far below the average class size in most schools, and we cannot even be sure that class size and pupil-teacher ratios are highly correlated.

The pupil teacher ratios filed on November 17 are also difficult to understand in that when they are divided into enrollment figures given in the same submission, they yield fractional numbers of teachers. For example, the enrollment at Beers

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[*] Defendants' data addition to Memorandum of November 17, footnote 2.

elementary school is 849. When this is divided by the pupil-teacher ratio 22.5, it should yield the number of teachers. However, in this case, as in most others, the result--37.73--is an unlikely number with which to describe the number of teachers in the school.

We have therefore refrained from using the pupil-teacher ratios given to us in this document. As noted in Chapter II, we calculated our own ratios from data submitted by the defendants separately on teachers and pupils. We checked defendants' submission of fiscal 1971 data, and found nineteen discrepancies.* In these cases dividing total teacher expenditures by ADM did not produce the figure for per pupil teacher expenditures submitted by defendants. We cannot tell, of course, whether the total or the per pupil figure is in error. We have used the total figures, and recalculated all figures on per pupil expenditures and average teacher cost. We list discrepancies in Table IV-1. We have used our own pupil-teacher ratio calculated from their data, deleting special schools, but otherwise including all teachers but not librarians and counselors. Area summaries from these calculations have been presented above in Chapter II.

On the other hand, total enrollment was said to be 89,988 as of October 22, in defendants' November 17 submission. This is up 37 from September 21. But in defendants' November 27 submission, total enrollment is said to be 89,516, or 435 less than in September. If this figure is correct, we need corrected per school figures, but have none.

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*Obvious and trivial rounding errors are not counted.

TABLE IV-1

Discrepancies in Fiscal 1971 Data*

School	ADM	Teacher Expenditure	Teacher Expenditure Per Pupil Defendants'	Teacher Expenditure Per Pupil Ours
Barnard	794	$370,774	$525.66	$466.97
Beers	939	471,596	491.95	502.23
Brent	313	195,372	586.74	624.19
Bunker Hill	1013	473,729	493.58	467.65
Burroughs	828	422,144	473.91	509.84
Cooke, H. D.	836	430,625	501.10	515.10
Green	1188	583,842	481.24	491.45
Kimball	1439	496,025	337.71	344.70
Maury	485	275,784	570.69	568.63
Meyer	1005	527,421	550.91	524.80
Miner	910	482,457	530.07	530.17
Murch	598	396,493	681.82	663.03
Noyes	732	311,601	425.77	425.68
Turner	973	424,314	436.37	436.09
Van Ness	651	376,086	578.16	577.71
West	516	286,868	550.94	555.95
Wheatley	733	460,240	625.87	627.89
Wilson	920	438,737	471.90	476.89
Woodridge	522	324,259	619.19	621.19

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*Defendants' Revised Submission to the Court, November 6, 1970.

Data for fiscal 1970 are also inaccurate. Taking the data submitted from defendants' revised submission of November 6, we calculated the average teacher cost per school. For total number of teachers, we added the individual teachers by degree as given us in Book II, noted above, and presumably utilized by defendants in their adjusted teacher calculations of November 17, submission. In Table IV-2 we list some anomalies: average teacher cost below and above the salary schedule, and near the extremes of that schedule.

We note that we are not claiming that the total teacher cost data are inaccurate. The error could lie there, or in the detailed teacher data. If the error lies in the latter area, then defendants' calculation of adjusted teacher expenditure is inaccurate. In addition, our calculation of pupil-teacher ratios based on these data, summarized above, is inaccurate, as are our regression results presented below. If the error lies in the total teacher cost per school, then all work on teacher cost per school must be inaccurate with respect to fiscal 1970--our work and defendants' work. This includes our results on teacher expenditure per school presented below.

We remind the court that we have used these data in good faith and at great expense. Yet we are very uncertain about them. We present our arguments on these data because defendants have used the same data (we presume) for their arguments. Defendants will be seen to have badly analyzed their own data and the likelihood is that our basic conclusions are not affected by random errors in the data, but what the precise facts of the matter are we do not know.

TABLE IV-2

Schools with Suspect Teacher Data

Average Teacher Salary, Fiscal 1970

Low Salaries		High Salaries	
Below Range:		Above Range:	
Powell Annex	$4,674	Hyde	$20,582
Savoy	5,723	Edmonds	16,667
Brent	5,989	Nichols Ave.	16,275
Eckington	6,984		
Bottom of Range:		Top of Range:	
Garfield	$7,978	Hearst	$15,615
Eaton	8,617	Stanton	13,983
Green	8,826	Key	13,904
Plummer	8,870	Grimke	13.364
		Powell	13,274
		Brookland	13,124

B. Special Schools

Defendants have presented expenditure comparisons without adjusting for special schools or special students. They claim, however, to be attempting to meet a pupil-teacher ratio of 14 in the special schools, which certainly makes these schools exceptional. Special students are blind, deaf (or near these extremes), mentally retarded or emotionally disturbed. They require special teachers who generally are paid at rates above the regular salary schedule.

Since both the teacher-pupil ratio and the salary are higher than normal in special schools we expect--and find--special schools spending considerably more per child than regular schools.* It is therefore illegitimate to include these special schools--which are all east of Rock Creek Park--in comparisons of expenditures east and west of the Park. The defendants consistently include these schools. We will consistently exclude them. They were excluded for example, in the list of schools with impossible range expenditures (Table IV-1), and in all summary data presented in Chapter II. We will at all times explain how we have handled the special schools when presenting our findings.

Which schools are Special? Defendants consider Bundy, Military Road and Pierce as Special Schools. However, in fiscal 1970, Lenox Annex enrolled only special students, and Grant had 62 special students out of a student enrollment of 126. For

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*This is less true, for some reason, in fiscal 1971 than in fiscal 1970.

fiscal 1970, therefore, we considered these five schools as special. Expenditure data is consistent with this interpretation of the data on special students. In fiscal 1971, having no data on special student enrollment, we have considered only defendants' three schools as Special.

C. Capacity

Capacity figures submitted by the Corporation Counsel are based on a regular classroom holding 30 pupils. At times overcrowded schools east of the Park are considered "not severely" overcrowded, when slightly over capacity. Capacity is, surely, an arbitrary figure , and we hold no quarrel with its definition.*

We will note, however, that the District seems content to get schools down to 100% capacity, without making any attempt to get schools up to 100%.With the mean capacity at about 83% for the city, it is not clear why getting a school down to 100% should be considered satisfactory. In addition, the schools west of Rock Creek Park have larger rooms, on the average, than those schools east of the Park. Therefore one might consider that being close to 100% capacity was at least not more of a hardship west of the Park than east, and possibly less of a hardship.

D. Grouping Schools West of the Park

Defendants have taken pains to criticize plaintiffs for lumping all thirteen schools west of the Park into one group.

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* As we have noted above, however, a lower capacity figure would show additional schools overcrowded.

> It is respectfully submitted that the Court errs when it considers the 13 elementary schools west of Rock Creek Park to be a monolith of white and rich pupils. The Court's decree has worked substantial changes in the character of these elementary schools.*

In analyzing the data submitted by the defendants it has become clear that schools west of the Park do not, indeed, comprise a "monolith of white and rich pupils." We have separated those schools into two groups. This was done simply by taking those schools less than 50% white, and asking if they could not be described as part of this "monolith". These schools were Hyde, Fillmore, Jackson and Hardy. In fiscal 1971, data for Key is given together with Hardy. In addition, defendants indicate that Key is properly part of this group.

> Bussing of pupils from overcrowded schools to underutilized schools west of Rock Creek Park has changed not only the economic composition but the racial composition of the receiving schools as well . . . For example, Jackson has a 96% Black enrollment; Hyde has a 52% Black enrollment; Fillmore has a 46% Black enrollment; Hardy has a 50% Black enrollment; Key has a 37% Black enrollment.**

We have identified the above five schools as "Group I" schools. Group II schools comprise the rest of the schools west of the Park:

Group I	Group II
Fillmore	Eaton
Hardy	Hearst
Hyde	Janney
Jackson	Lafayette
Key	Mann
	Murch
	Oyster
	Stoddert

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*Defendants' Memorandum of November 17.

**Defendants' Memorandum, p. 22; our emphasis.

This distinction, then, is made solely on the basis of the percent white in these schools, buttressed by defendants' linking them together. We shall find that this grouping is an analytically powerful one. It does turn out that these schools also have an interesting geographical definition, Group I schools being closest to the Potomac River of all schools west of the Park.

E. The Relevance of Correlations

Plaintiffs' case is that some schools, essentially the eight in Group II west of the Park, are favored in school administration at the expense of the other schools, except Special Schools and Model Schools (which are deliberately chosen for compensatory programs). These eight schools have 2891 children or 3.1% of the elementary school students in fiscal 1971. Correlating the values of any two variables over all schools is not the proper way to determine if there is such favoritism. The variation occuring among schools east of the Park may not correspond to the same pattern as that between east and west of the Park. For example, schools with relatively high income east of the Park might have less teacher expenditures per student than relatively poor areas. This negative relationship within east of Park schools would counter-act the important positive relationship between east of the Park and west of the Park.

This is not just a theoretical argument. It is, secondly, important politically: if school decision-makers do not recognize or care about income (or percent black) variations

within black dominated populations, but do care about the difference between black and white neighborhoods, then the effect described above is possible and even likely. Gross discrimination could be hidden behind an overall small correlation. It is wise, given the political realities of Washington, D.C., and given the argument in this case, to investigate the difference between schools west of Rock Creek Park and other schools. Because it is an easily identifiable black area, Anacostia is a good comparison area.

Thirdly, our argument is not just theoretical and political. It is real. Within Anacostia, a low income area, we find that the higher the 1959 income associated with a school, the lower the per pupil expenditure. This relationship does not imply that a considerably more wealthy area will have even lower per pupil expenditures. We find a significant negative effect on per pupil teacher expenditure from being in an Anacostia school. The correlation between per pupil teacher expenditures and the location of the school in Anacostia is -.273.* Similarly, we find a correlation of +.334 for teacher expenditures for schools west of Rock Creek Park vis-a-vis schools in the rest of the city. Thus, ignoring variations within areas, we see that variation in expenditures per pupil is highly related to the areas themselves. There is, in other words, a distinct variation between areas

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*This correlation is calculated from 123 non-special schools, for fiscal 1970 data. A binary variable was given the value 1 for Anacostia schools, 0 for all other schools. The correlation for 128 schools including the special schools, was -.233. The negative sign indicates that expenditures in Anacostia schools were lower than elsewhere, in general.

that is masked by a different kind of variation within areas. The variation within areas may be considered random. This is in accord with plaintiffs' argument that majority white schools are favored. Variations in whiteness among majority black schools may not be relevant.*

When there is an attempt to determine a general relationship for the entire city, then overall correlation techniques may be valid. When the question is whether one extreme of the population is favored, then uncorrelated variation can reduce a real effect to a seeming non-effect. Use of binary variables to distinguish relevant populations is a more appropriate procedure.

With this technique, in addition we can test whether the relationship ascribed to the entire city holds for the sections we have noted (Anacostia, Model Schools, all schools west of the Park, or Group I and Group II west of the Park.) For example, in Chapter VII below, when discussing the relationship between pupil-teacher ratios and size of school, we show that there is no single relationship in all these parts of the city. We have already noted that such relationships will not hold in Special Schools, and that correlational analysis requires some control for these schools. (We favor the ultimate control: exclusion from the data.)

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*We could as correctly have said 'Majority wealthy schools are favored. Variations in incomes among poor schools may not be relevant." This argument is essentially the same as that made by Julius Hobson in his analysis submitted concurrently to the Court.

We are critical, therefore, of the attempt by defendants to reply to plaintiffs' argument by use of a technique which is virtually designed to mask the verity of plaintiffs' allegations. Our arguments below rest on comparisons between schools west of Rock Creek Park and the rest of the city. Our analyses separate west of the Park and Model Schools from the rest, and control for special students as explained above. Where significant, Anacostia schools are also separated from the rest of the city.

CHAPTER V

BUSSING AND BUILDING IN THE DISTRICT OF COLUMBIA

Defendants have offered analyses of their efforts to reduce over-capacity in Part I of their Memorandum of November 17. Their argument is based on a non-sequitur which we have already pointed out in Chapter III:*

> By effective utilization of this additional space, the defendants have succeeded in reducing the city-wide average pupil-teacher ratio to 20.9-1.

The decline in the overall pupil-teacher ratio says nothing at all about effective utilization of space. That is a statement about the distribution of pupil-teacher ratios which, we shall see, is not random with respect to Rock Creek Park. We find it difficult to counter an argument which does not exist. Therefore, we will proceed to discuss defendants' claims without being bound to their line of argument. In this Chapter we will investigate the District bussing program, especially as it has affected overcrowding in schools. We will proceed in two parts: First, we look at who was bussed, where, with what results, and in comparison to what potential. Second, we offer a brief analysis of the relative effects of building and bussing - and the decline in student population - in reducing overcrowding.

A. The D. C. Bussing Program

The number of children bussed in any year is the result of offers to bus, the physical conditions of bussing, conditions at the sending and receiving schools, and the preferences of parents. Defendants at the moment**

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*Defendants' Memorandum of November 17, page 6, emphasis theirs.

**In his supplemental affidavit of August 12, 1970, Benjamin Henley spoke in glowing terms of several "specific examples [which] give some idea of the improved educational opportunities created through bussing." (pages 4-5)

would have us believe that parents do not like bussing,[*] but we are more inclined to view parental choice in this regard as a function of the circumstances just mentioned, not an absolute like or dislike. We do note, from evidence submitted by defendants, that construction of 250 demountable classroom units--space for 6,250 students at 25 per unit--was accompanied by a reduction in bussing of only 182 students.[**] We do not argue that, even given good bussing conditions and good receiving schools, parents would prefer bussing to good neighborhood schools. We do not pretend to know what parents want. But we must stress that their behavior seems to indicate a preference for bussing over currently offered neighborhood schools. The reduction in bussing may reflect many factors, including the kinds of schools to which the children were bussed. This is not a matter which is out of the control of the defendants. Therefore we shall

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[*] On page 16 of the Defendants' Memorandum we find:

> Pupils, teachers and parents enthusiastically endorse the use of demountables to relieve overcrowding. See the attached article written by Lawrence Feinberg in the Washington Post.

In fact, only principals and teachers are quoted in the article, not pupils nor parents.

[**] Difference in bussing figures between 1969-70 and 1970-71. See article by Lawrence Feinberg, "Prefab Classrooms Ease Crowding in Anacostia Schools," Washington Post (date unknown), submitted with Defendants' Memorandum of November 17. Feinberg indicates a greater reduction in bussing than defendants' data show.

analyze the bussing experience of fiscal 1970 and fiscal 1971 to see if perhaps the actions of defendants themselves, and not the abhorrence of parents for bussing, is the cause of the reduction in the number of children bussed.*

1. Defining Preferred Schools

A parent deciding whether to bus his child will presumably weigh advantages against disadvantages. One advantage he will count is the generally regarded quality of the receiving school. If Plaintiffs' argument that certain white schools are favored over the majority of (black) schools is true, then the percent white in a school is some indicator of quality. We stress that we are not saying, and not assuming that parents contend, that the fact of a school having white children makes the school better because the children are in any way different from black children. But if, because of the presence of whites--especially whites west of Rock Creek Park--the school is favored with lower pupil-teacher ratios, better teachers, more challenging materials, etc., then the percent white will be an accurate indicator of school quality. The black parent may not be concerned about the color of the children with whom his son or daughter attends school, but he may care about the school, its attitudes, policies, and resources.

On this argument we will look at two kinds of schools to which parents may prefer to send their children: Those which are 1/3 or more white, but not as much as 1/2 white, we will denote by the symbol W'. Those which are 1/2 or more white we

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*For further discussion on parental reaction to bussing, see "D.C. Bussing: Both Races Gain," by Aaron Latham, The Washington Post, April 26, 1970.

we will denote by the symbol `W". We will occasionally remind the reader of these definitions.

2. Bussing West of the Park

From data relating to September 21, 1970, we calculate the following percentage white for our two groups of schools west of the Park, after children are bussed in.*

Group I		Group II	
Fillmore	54% white	Eaton	81% white
Hardy	49%	Hearst	77%
Hyde	47%	Janney	81%
Jackson	4%	LaFayette	95%
Key	63%	Mann	65%
		Murch	91%
		Oyster	84%
		Stoddert	90%
Per pupil average	47.2% white		85.3% white

Thus all Group II schools are in the W" category of 50% or more white schools. Group I schools are in W" (Fillmore and Key), in W' (Hardy and Hyde), and not in either category (Jackson).

Children are bussed both east and west of the Park. However, there are no schools east of the Park which qualify as either W' or W".** We can calculate the change in bussing to W' and W" schools from west of the Park data only:

	Fiscal 1970	Fiscal 1971
W' schools	141	123
W" schools	330	359

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*Figures obtained from "Membership of Elementary Schools on September 21, 1970." The percentage white is for 1970-71. No data on 1969-70 racial distribution were available to us. Where necessary (and appropriate) we have used this data to hypothesize a 1969-70 racial distribution.

**Congress Heights Annex is a W" school, but the obvious solution of integrating with Congress Heights would drop the combined percent white to 18.47.

In Fiscal 1970, 563 children were bussed west of the Park, and 471 of them (83.6%) to W' or W" schools. In Fiscal 1971, 548[*] children were bussed west of the Park, and 482 (87.9%) of them to W' or W" schools. However, in Fiscal 1970, 1702 children were bussed altogether, and in Fiscal 1971, 1520 children.[**] Thus, in Fiscal 1970 a child had a 27.7% chance of being bussed to a W' or W" school, and in Fiscal 1971 this improved to 31.7%. It seems strikingly possible, in view of the virtual constancy of the actual numbers--and the relative shift to W" schools--that the reason a larger percentage of bussed children are in W' and W" schools is because children bussed to other schools have dropped from the program.[***] Only 19.4% of bussed children were received by W" (Majority white) schools in 1970; 23.6% in 1971.

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[*] This figure is obtained by transforming the percentages of "Total Pupils Bussed in from:" in the table on p. 22, Defendants' Memorandum. The actual bussing figures for the whole D.C. system have not been submitted to us for 1970-71.

[**] See Defendants' Memorandum, p. 12.

[***] Indeed, we have calculated the ratio of children bussed west of the Park in 1971 to those bussed west in 1970; and, similarly, for bussing east of the Park. Bussing west of the Park decreased by only 2.7% from 1970 to 1971, whereas it decreased by 14.7% east of the Park.

The importance of these figures, however, lies not in their absolute magnitude, but in their relationship to what could have been achieved. We have calculated the number of empty places in schools after bussing, the number of children bussed, and hence the total capacity available for bussing children. We offer these percentages of available capacity utilized by bussing in Table V-1. There we see that utilization of capacity declined for both groups between 1970 and 1971. It was lower in W' schools than W' schools in Fiscal 1970, and essentially equal in 1971. In terms of schools arranged by Group I and Group II, including Jackson which is neither W' or W", the following was the case:

Percent of Available Capacity Utilized by Bussing*

	Fiscal 1970	Fiscal 1971
Group I	35.9	30.9
Group II	23.9	25.7

Utilization of available capacity was lower for Group II schools than for Group I schools in both years, though closer in the latter year due mostly to the decline in utilization of available capacity in Group I schools.

By actually utilizing available capacity, some schools currently classified as W" would change, with the influx of blacks, to W', and both W' schools would fall below one third white. Therefore we have calculated available capacity in

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*Figures obtained for 1969-70 from submitted table dated August 7, 1970, "Enrollment Capacity Ratio (30-1) With and Without Bussing as of June 1970," and "Membership of Elementary Schools on September 21, 1970."

TABLE V-1

Percent of Available Places Filled by Bussing to W' and W" Schools.*

	Fiscal 1970			Fiscal 1971		
	Spaces	Bussed	%	Spaces	Bussed	%
W'	364	141	38.7	419	123	29.3
W"	1053	330	31.3	1255	359	28.6

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*Figures obtained for 1969-70 from table submitted dated August 7, 1970, "Enrollment Capacity Ratio (30-1) With and Without Bussing as of June 1970" and data on school enrollments as of October 21, 1970, submitted on November 17, 1970.

W'' schools restricting use of this capacity to maintain at least 50% white (or 33% white if W').* We find, under this criterion, 646** available places in W'' schools west of Rock Creek Park in fiscal 1971, and 127 in W' schools. That is, there were three times as many places available in majority white schools that could have been utilized without threat to the majority white nature of these schools than were utilized. There were two times as many places in W' schools than were utilized, keeping these schools at least one third white.

3. Bussing to Relieve Overcrowding

In fiscal 1970, 66.9% of the children bussed were sent to schools East of the Park. We suggest that this figure might have influenced the decline in the number bussed in fiscal 1971 (of which 63.9% are bussed east of the Park). Furthermore, in fiscal 1970, regarding only the schools which were already bussing out children, another 1273 children would have had to have been bussed to reduce the operating capacity of the sending schools to 100% (disregarding overcapacity elsewhere). This is detailed in Table V-2. Over half of these children, as has been pointed out, could have been bussed to W' schools without affecting the racial nature of these schools.

The overall capacity utilization rate before bussing west of the park was 34.5%. In the schools receiving bussed children, the rate was 55.9% before bussing. In the schools east of the park receiving bussed children, the utilization rate was 67.3%. That is, children were bussed into those schools west of the park which were already operating at utilization rates above the average for west of the park, and even more children were bussed east of the park to schools which were operating, before, bussing at even higher capacity utilization rates.

*We argue elsewhere that D.C. norm of 82.4% enrollment-capcity is now the relevant one for judging capacity distribution. Therefore, it may be the case that west of the Park Schools should not expand above this percentage.

**This figure was computed for 1970-71 from the table "Membership of Elementary Schools on September 21, 1970," and data submitted on Nov. 17th. Another 250 places are available west of the Park in W'' schools but to bus black children into them would turn them into W' schools.

TABLE V-2

Bussing to Relieve Overcrowding*
(1969-70)

	Enrollment capacity ratio pre-bussing	Enrollment capacity ratio post-bussing	No. more to be bussed to get down to 100% capacity
Draper	141.1%	112.1%	146
Garfield	126.1	105.2	45
Hardy (& Annex)	114.1	100.1	2
Ketcham (& Annex)	158.8	148.5	378
Kimball	131.8	126.7	281
McGogney	91.9	89.9	0
Moten	143.7	113.8	147
Orr	133.1	113.6	53
Simon	112.8	104.6	50
Green	85.2	81.3	0
Turner	131.4	120.4	171
Total in bussing schools:			1273

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*From "Enrollment capacity ratio with and without bussing as of June, 1970.

4. Bussing To Achieve Racial Balance

Defendants note that, of schools west of Rock Creek Park, "Jackson has a 96% black enrollment, Hyde has a 52% black enrollment, Fillmore has a 46% black enrollment, Hardy has a 50% black enrollment, Key has a 37% black enrollment."* These schools exactly comprise our Group I. In contrast, bussing has had relatively little effect on the racial composition of Group II schools. We have calculated the racial composition of these schools before bussing, to determine the impact of bussing on that composition. To do this we assumed that all children bussed were black. Given this assumption, we merely subtracted the number bussed from the total number of blacks, and divided the remaining black figure by the sum of these blacks and the whites in each school. The results of this calculation appear in Table V-3.

The average percent black in Group I schools is 11.2% before bussing, and 52.7% after bussing. Group II schools have 5.9% average blacks before bussing, 14.4% after bussing. Group I schools have been made almost five times as black as they were, but Group II schools were made only just over twice as black. In other words, schools which were white to begin with have not been brought into racial balance to the

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* Defendants' Memorandum of November 17, page 22.

TABLE V-3

Racial Composition of Schools West of the Park, Fiscal 1971, Before and After Bussing.*

School Group I	% Black Pre-bussing	% Black Post-bussing
Fillmore	0	46.3
Hardy	6.8	50.6
Hyde	20.9	52.7
Jackson	86.2	95.8
Key	0	37.2
	11.2%	52.7%

School Group II		
Eaton	8.7	18.7
Hearst	4.0	23.3
Janney	0	19.1
Lafayette	5.9	5.9
Mann	15.1	35.2
Murch	6.5	9.4
Oyster	16.0	16.0
Stoddert	10.3	10.3
	5.9%	14.4%

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* Figures from "Membership of Elementary Schools on September 21st, 1970." and numbers bussed (transformed from percentages) on p. 22, Defendants' Memorandum, "1959 Median Family Income Adjusted for Schools Receiving Students from Neighborhood of Different Income Levels."

extent that schools which initially had more blacks have been.

From our previous calculations on the number of black children who might have been bussed west of the Park, maintaining white majorities in W" schools, we are able to ask how effective the bussing program has been west of the Park. We take the percent black possible minus the percent black before bussing as the space within which the bussing program operated. The percent black after minus the percent black before is the impact of the program. The ratio of these two figures gives a measure of the relative successful effort expended to achieve racial balance:

$$\text{Success} = \frac{\%\ \text{black after} - \%\ \text{black before}}{\%\ \text{black possible} - \%\ \text{black before}}$$

The success in achieving racial balance, relative to potential for fiscal 1971 is given below:*

Group I	
Fillmore	92.6
Hardy	50.0
Hyde	48.9
Jackson	100.0
Key	74.4
True average	63.4%

Group II	
Eaton	31.9
Hearst	48.2
Janney	38.9
Lafayette	0
Mann	57.5
Murch	38.7
Oyster	0
Stoddert	0
True Average	28.1

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*Jackson, being already majority black, is considered to have no more capacity for blacks .(Fiscal 1971)

It should be obvious that of schools west of the Park, the Group II schools are not just whiter, but are definitely favored in effort to reduce that percent white.

5. Bussing of Needy Children

In the Lawrence Feinberg article referred to above, Bradford A. Tatum, administrator in charge of the bussing program makes two puzzling statements:

> "There's no long line of parents waiting for their kids to be bussed."
>
> "[I have] to turn down many requests from Negro parents for transfers to schools West of the Park."

The only way these two statements can both be true is if the parents who request transfer to schools west of the Park are already in the bussing program. We have argued above that there could be more bussing to schools west of the Park: that there is capacity, that it would relieve overcrowding, that it is mechanically feasible with only a few more busses,* that it would aid in achieving racial balance. Yet Mr. Tatum argues that to accept these transfer requests would aggravate socio-economic imbalance. We will investigate this claim and find it false.

We will assume throughout that all the needy children in a school with bussing were bussed into that school. This biases the figures against our argument that bussing has been ineffective. We will use here the data presented by defendants on November 20, in which participation in the free lunch program

*See section 6, below.

being defendants' definition of need. On page 21 of their November 17 Memorandum the defendants submit that:

> When pupils are bussed to receiving schools West of Rock Creek Park, the income levels are substantially different, producing socio-economic integration.

On page 23 they argue that:

> Currently the best available method of identifying the presence of low-income pupils in the elementary schools of the District of Columbia is through the information on the number of pupils who qualify for free lunches in each school. This measure may be superior to the data on family income in the census tract of the school for 1959 because it is more timely and because it depicts the income of the families of the pupils attending the school rather than the income of the school's neighborhood at large.

Of the 323 children bussed to Group I schools in Fiscal 1971 86 or 26.7%, were needy. Of the 225 children bussed to Group II schools 100, or 44.4%, were needy.* However the percentages of the entire school who are thus needy are quite a bit smaller. These figures are as follows:

Free Lunch Children as a Percentage of Enrollment**

Group I	
Fillmore	12.5
Hardy	7.2
Hyde	14.0
Jackson	19.1
Key	12.7
Per Pupil Average	12.5%

Group II	
Eaton	6.0
Hearst	7.2
Janney	3.9
Lafayette	0
Mann	9.2
Murch	1.6
Oyster	4.8
Stoddert	1.1
Per Pupil Average	3.3%

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* This is a maximum figure, assuming there were no needy children in receiving schools before bussing.

**Revised school lunch data received on November 27, and enrollment data referring to October 21, 1970 (received November 17) and used in these calculations.

We have commented extensively above on the unreliability of data on participation in the free school lunch program. Accepting those data for the moment as a measure of low-income children in schools, the percentage of needy children in schools west of the Park as given above is:

Group I schools	12.5 %
Group II schools	3.3 %

From Table V-4 we see that Group I schools could have accomodated 50% needy children and Group II schools could have accomodated 24.5% needy children, by bussing. Group I schools therefore succeeded to 12.2% of their potential capacity for needy children, whereas Group II schools succeeded to only 11.2% of their potential.* Certainly we cannot agree with defendants' statement that:

> The racial and socio-economic mix has changed in the elementary schools west of Rock Creek Park as a result of volunteer bussing. Many of these schools have a majority of black pupils and the economic level of the population has declined.**

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*Potential capacity is calculated by assuming that non-needy bussed children are replaced by needy children, and spaces are filled (not to exceed 50% needy) with needy children. Utilizing all spare places - i.e., dropping the restriction for SES integration - Group I schools have succeeded to only 8.5%, Group II schools to 11.0% of their potential.

**Defendants' Memorandum of November 17, p. 41

TABLE V-4

Potential Help to Needy Children Through Bussing (Fiscal 1971)*

School	(1) Capacity	(2) Spare Capacity	(3) Needy Children	(4) Children Bussed	(5) Potential Additional Needy Children Bussed (4) - (3)	(6) Total Potential Needy Children (2)+(3)+(5)	(7) Potential with SES Integration ** Number of Places	(8) Potential with SES Integration ** Potential Needy
Group I								
Fillmore	270	135	17	66	49	201	135	50%
Hardy	330	167	12	78	66	245	165	50%
Hyde	240	107	15	45	30	142	120	50%
Jackson	270	171	19	66	47	237	135	50%
Key	300	120	23	68	45	188	150	50%
	1410		86			1013	705	50%
Group II								
Eaton	510	121	24	41	17	174	162	31.8%
Hearst	300	66	17	44	27	110	110	36.7%
Janney	600	187	16	79	63	266	266	44.3%
Lafayette	690	22	0	0	0	22	22	3.2%
Mann	300	115	17	43	26	158	150	50.0%
Murch	630	17	10	18	8	35	35	5.6%
Oyster	300	8	14	0	0	22	22	7.1%
Stoddert	300	116	2	0	0	116	116	38.6%
	3630		100			908	888	24.5%

*Figures taken from November 17th enrollment data; pp. 25-26 of Defendants' Memorandum, "Needy Lunch Children by School, October 21, 1970"; and p. 22 "1959 Median Family Income Adjusted."

**It is assumed that bussing needy children should only take place up to 50% of capacity taken by needy children. Without this constraint another 338 places would become available in all.

6. Examples of Bussing Possibilities: Sending Schools

Since current figures on bussing are not available to us, we will use Fiscal 1970* figures to investigate bussing policies from the point of view of the sending schools. We are not here actually advocating increased bussing from these schools. We are merely exploring ways in which the additional capacity demonstrated above might have been efficiently utilized. The issue is historic. It may, however, cast some light on the good faith of the defendants given their argument that they have followed the court's order to achieve racial balance by bussing.

Draper:	No.	% of Capacity
Capacity	1218	
Enrollment pre-bussing	1729	141.1
Enrollment post-bussing	1365	112.1
No. of children bussed	364	
Overcrowding post-bussing	147	

Draper sent to West of the Park:

	Children	No. of Busses	Spare capacity in receiving school
Hardy	93	2	114
Janney	51	1	170
Key	71	2	105

Since busses appear to take up to 56 children each (Hendley to Nichols Ave. took 113 children in 2 busses) more children could have been sent to Key without adding another bus. The remainder of Draper's overcrowding could have been "solved" by sending 2 more busses to Janney.

*From "Enrollment Capacity Ratio With and Without Bussing as of June, 1970."

Moten:	No.	% of Capacity
Capacity	1068	
Enrollment pre-bussing	1535	143.7
Enrollment post-bussing	1215	113.8
No. of children bussed	320	
Overcrowding post-bussing	147	

Moten sent to west of the Park:

	Children	No. of Busses	Spare capacity in receiving school
Fillmore	78	2	121
Mann	43	1	117

Enough children could have been bussed to eliminate Moten's overcrowding by providing just two additional busses.

Turner:	No.	% of Capacity
Capacity	840	
Enrollment pre-bussing	1104	131.4
Enrollment post-bussing	1011	120.4
No. of children bussed	93	
Overcrowding post-bussing	171	

Turner sent children to these schools, all W", west of the park:

	Children	No. of Busses	Spare capacity in receiving school
Eaton	37	1	122
Hearst	33	1	35
Murch	24	1	-34

Turner was the only school sending children to Murch, which was already over 100% capacity before children were bussed to it. Both Eaton and Hearst, to which busses already were dispatched from Turner, are closer

to Turner than Murch, and had enough spare capacity to take these 24 children. Three more busloads of children from Turner, at least one of which could have gone to Eaton, would have solved Turner's overcrowding.

B. Bussing vs. The Building Program: An Analysis

Defendants have exaggerated the importance of their building program in reducing overcapacity. In addition, they have presented a financial analysis of their demountables-placement program which is seriously in error. We will discuss these two issues in turn.

1. Building to Reduce Overcrowding

> In its opinion of June 19, 1967, the Court found that of 131 elementary schools in the District of Columbia, only 40 were at or under 100% capacity whereas 91 were over 100% capacity. By contrast pupil enrollments as of September 21, 1970 clearly show that overcrowding at the elementary school level has been all but eliminated.*

The relevant comparison is no longer with 100%. The D.C. school system is operating at 82.4% of capacity in Fiscal 1971.** Once again it is the distribution of actual capacities, not the presence above or below a defined 100% that counts. Defendants argue that:

> . . .the most important factor leading to the elimination of overcrowding has been the Capital Outlay Program . . . the Board's stated commitment to construct schools in the far northeast, the areas of the greatest overcrowding, has dramatically resolved the overcrowding problem.***

We are not entirely certain what schools make up the "far northeast" but we have investigated those in the area between and north of the Baltimore and Ohio's R.R. Co. tracks to Baltimore via Ellicott City and to Baltimore via Bladensbury. The defendants on their bar chart (page 5) show that in the "Far NE" they have built 396 "permanent seats" between 1968-70. Since we can account for the construction of 390 seats in the schools

*Defendants' Memorandum of Nov. 17, p.

**Defendants' Memorandum, p. 4.

***Calculated from October 21, 1971 enrollment data, submitted November 17.

in the area defined above (LaSalle, Woodridge, Bunker Hill, Burroughs, Langdon, Slowe, Noyes) we are probably discussing the same area.

These 7 elementary schools in fiscal 1971 had a total enrollment of 5976 pupils and a total capacity of 6570; the enrollment-capacity ratio (including the use of demountables) was therefore 90%. However, in 1968-69 the D.C. school population had already begun to decline (1968-9 to 1970-71 it declined 4%) and in fact without any building whatsoever the enrollment-capacity ratio would have declined from 101% in fiscal 1968 to 96% in fiscal 1971 in these schools. Declining population alone would have reduced these schools to less than 100% capacity! Declining population and building contributed about equally to the decline to 90% of capacity, no children having been bussed from these schools. See Table V-5.

In the "Far Southeast" (which we have defined as the area South of the Suitland Parkway: the schools Turner, Green, McGogney and Annex, Congress Heights and Annex, Draper, Simon, Hendley, Leckie and Patterson) the Board of Education can rightly claim to have "dramatically" reduced if not "resolved" the problem of overcrowding. Faced by a situation of 134% enrollment in these 9 schools in 1968 they have succeeded in reducing this to 81.4% in fiscal 1971, and this in a situation where they were faced by a rising school population (See Table V-6).

TABLE V-5

ADMs and Capacities 1968-71 in the Far Northeast

School	Fiscal 68 ADM	Fiscal 70 ADM	Fiscal 71 ADM	Fiscal 68 Capacity	Fiscal 71 Capacity
LaSalle	1030	981	912	990	990
Woodridge	607	562	525	570	690
Bunker Hill	1158	1050	1019	1116	1116
Burroughs	919	848	822	918	978
Langdon	675	838	792	738	858
Noyes	659	631	711	708	738
Brookland-Slowe *	1199	1284	1187	1140	1200
	6247	6194	5968	6180	6570

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*Brookland and Slowe have been combined since they were given this way in fiscal 1968 data.

NOTE: Figures taken from Nov. 17th enrollment data; referring to October 21, 1970, "Average Teacher Expenditure 1969-70"; and "Elementary Schools Fiscal Years 1963, 1965, 1968."

TABLE V-6

ADMs and Capacities 1968-71 in the Far Southeast (South of Suitland Parkway)*

School	Fiscal 68 ADM	Fiscal 70 ADM	Fiscal 71 ADM	Fiscal 68 Capacity	Fiscal 71 Capacity
Turner	944	1036	959	720	1366
Green	1360	1167	1200	1166	1416
McGogney (+ Annex)	1352	1512	1449	1056	2106 **(1656)
Congress Hts. (+ Annex)	901	1206	1331	480	1556
Draper	1394	1167	1130	980	1130
Simon	1197	1174	1175	960	1530
Hendley	1327	1710	1902	1056	1716
Leckie	not built	not built	602	not built	1076
Patterson	1292	1277	775	1050	1290
	9967	10249	10523	7468	13186
					-450
					(12936)

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*See previous table V-5 for derivation of figures.

**See text.

Two things concerned us, however, about the quality of the data submitted on these schools:

McGogney and McGogney Annex - In data submitted to us "Elementary School Membership on September 21, 1970", the combined enrollment of the two schools is listed as 1451, with McGogney providing 1056 regular seats and the Annex another 1050 (in demountables) giving a total capacity of 2106 and a surplus of 655 seats for the two. In data submitted to us at a later date with the Defendants' November 17th Memorandum we notice that the capacity total is still the same for McGogney but that that of the Annex has fallen by 450 seats to a total of only 600 seats (presumably in demountables) - all in the space of less than a month.

Congress Heights and Annex - From the September 21st data on the distribution of whites and blacks between the Main school and the Annex, a disturbing picture emerges (which is already the subject of another portion of this litigation):

	Black	White	Total	%Black	%White	Enrollment-Cap. Ratio
Main School	1046	56	1102	94.9	5.1	70.8
Annex	33	196	229	14.4	85.6	47.7

Thus, whites make up 18.4% of this particular school population but are very unevenly distributed between the two schools (possibly benefiting further from the lower enrollment-capacity ratio in the Annex.) The enrollment-capacity

ratio in the Main school is given as 70.8%, from the ratio $\frac{1102}{1556}$, which *includes* the Annex. The correct figure to give of course is the one *excluding* the Annex which is $\frac{1102}{1046}$ = 105.4%. The Main school was in fact 5.4% *over* capacity compared to the 47.7% of capacity situation in the "white" Annex. By giving the two together the over-capacity situation in one school is obscured by being averaged out.

Further in the geographical grouping in question the whites are concentrated in only two other of the schools (in Leckie, a new school where 176 of them make up 29.2% of the school and in Patterson where 98 make up 12.6%). Indeed out of 11 schools (counting Congress Heights Annex and McGogney Annex) whites are concentrated in only three.

2. On the Economics of Bussing

On September 21, 1970, after 1520 children had been bussed, a further 2343* children were in overcrowded schools and needed to have places found for them for the schools to operate merely at 100%. It might have been advantageous to provide transportation for these children to underutilized schools. Since most of the children bussed were

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*From "*Membership of Elementary Schools on September 21, 1970.*" We would point out that 12,632 children were in these schools and were therefore to some extent affected by overcrowding. In other words, at this date 14.2% of the D.C. school children were in overcrowded schools. We further note that one month later, the figure 2343 had been reduced to 1385, although 13.7% of D.C. children were still in overcrowded schools.

from overcrowded schools, the total overcrowding in the system, absent bussing, would have involved about 3800 children, or 4% of the elementary school population. We have argued that one reason why bussing is not more popular--assuming, of course, that it is well advertised and well administered--is that the receiving schools are not perceived to be superior to the sending schools.* Since only one bussed child in five went to a W" (majority white) school in fiscal 1970, it is not surprising that parents feel this way, if plaintiff's argument that Group II schools west of the Park are favored is correct.**

The defendants argue a case against bussing on the basis of the economy of demountables.*** They claim that the annual cost of bussing 30 children is $10,260, compared to the annual cost of a demountable unit of $3,300, pro-rating that unit over ten years.**** Defendants calculation was as follows:

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*This reason appears as argument number 4 on Defendants' list of parental objections, Memorandum of November 17, p. 13.

**The chance of being bussed to a Group II school was slightly higher in fiscal 1971, presumably because children not being bussed to W" schools were less eager to continue being bussed. This repeats an argument we have made above.

***See Defendants' Memorandum, p. 15

****We note that Feinberg, in his Washington Post article, op. cit., claims a 20 year life for these units. We assume defendants accept the ten year figure as correct, since this is the figure they used.

Cost of demountable, including toilets and site improvements	$ 33,000
Bussing @ $10,260 a year for 30 pupils	$102,600

The advantage of demountables is claimed therefore to be $6,960 per year.

Defendants' calculation is incorrect on several counts. First of all, bussing to underutilized schools with low pupil-teacher ratios does not require adding a teacher.* A demountable classroom, on the other hand, does require a teacher. The annual cost to the District of a new teacher must be at least $10,000, and we will add that cost to the calculation. Secondly, a demountable room must be heated and cleaned and kept in repair, whereas underutilized room is already heated and cleaned, and probably suffers very little more damage from a little more use. To be conservative, we make no estimate of this expenditure.

Finally, defendants neglect to calculate that a demountable must be paid for in advance of the ten years for which it is used. Busses, on the other hand, are paid for annually. Therefore, there is an interest charge on the demountables. We assume that the interest rate is 4%, that the demountables are paid for by a sinking fund arrangement from which 10% of

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*Defendants admit as much when they say, on page 15 of their Memorandum:

> Admittedly, the bussed child helps to fill up an already existing building, helps adjust or equalize class size in the receiving school as well as in the sending school, and the child may get a better education because he is in a smaller class.

the principal is retired each year. Furthermore, to be conservative, we assume that each year's debt is paid at the beginning of the year, thus saving that year's interest. The total interest cost is $5,940. Our calculation of the total ten-year cost of demountables is:

Initial cost	$ 33,000
Interest	5,940
Teachers at $10,000 per year	100,000
Maintenance, heat, etc.	----
	$138,940

The annual average cost of a demountable is at least $13,894, or almost $3,600 more than the bussing cost, per year. If we include the $10,000 cost of moving a demountable one time, then demountables cost almost 50% more per year, on the average, than bussing. If demountables are posed as a flexible solution, this is the minimal difference between these two plans which can come from the figures given us.

We do not wish to appear to be necessarily arguing for a bussing policy over new construction, be it of demountables or more permanent buildings. However, we do find the financial analysis of the question of bussing vs. demountables presented by the defendants to be totally inadequate. We are led to wonder if any serious thinking on this subject preceded defendants' policy decisions.

CHAPTER VI

THE ECONOMIES OF SCALE ARGUMENT

Defendants rely heavily on the concept of "economies of scale" to justify higher expenditures in the schools west of Rock Creek Park. These schools are, indeed, smaller on the average than schools east of the Park. As we have shown, they are also underutilized more than schools east of the Park, which makes them operate as even smaller schools. Even if there are true economies of scale, then, it would be improper to apply them as an explanation of increased costs for a lower enrollment to the extent that this enrollment is itself the result of a deliberate and unequal school policy.

However, Defendants have failed to show true economies of scale, they have failed to calculate the amount to which the reputed economies explain variation in expenditures among schools, and they have failed to estimate the size-expenditure relation, to see if it is in fact steep enough, given the range of school sizes in the District, to exceed the ±5 percent of mean teacher expenditure per pupil limit for which Plaintiffs have argued.

We will rectify some of Defendants' errors, being unable to rectify them all with the data at hand. First we will demonstrate that Defendants have made no argument for economies of scale. They have omitted the most important element required by such a statement: the kinds of things produced must be the same from both large and small schools. We will briefly discuss some relevant

literature which recognizes this basic requirement of controlling for variation in school quality.

Second, we will analyze the data on which the economies of scale argument is based. We will show that there is some relationship between size and expenditure per pupil, though, not knowing whether the large schools are as good as the small ones, we cannot tell if this represents economies in production or discrimination in resource allocation. However, being most generous by assuming that the large schools would be as good as the small schools with the reduced expenditures implied by the data, we find that the effect of size does not account for all the expenditure differences observed. We offer precise estimates of the presumed "effect" of size, reminding the reader several times that without proper quality controls, there is no way to distinguish real economies from arbitrary policy. We will indicate what might be a reasonable estimate of a technologically (as opposed to arbitrary) effect of scale.

A. Economies of Scale in Fact and Fiction

Defendants have utilized an argument from an article by June O'Neill and Arlene Holen as published by The Washington Post.* This article was attached to and quoted extensively in Defendants' Memorandum, pages 18 and 19. Unfortunately, no economies of scale can be demonstrated from the discussion of the data in this article, or in Defendants' Memorandum.

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*June O'Neill and Arlene Holen, "The Division of D.C. School Funds," The Washington Post, October 15, 1970.

1. The Theory of Economies of Scale

If, other things equal, there were no negative effect on outcomes of schooling from larger schools, if students were randomly assigned to schools by size (i.e., no variation among schools in student background), and if the production facilities of the schools were of equal quality (teachers, materials, etc.) and randomly assigned to schools, then we could estimate economies of scale as easily as O'Neill and Holen suggest. We will discuss the possible harmful effects of size only briefly in a footnote in section B, below. Students are not randomly assigned to schools, and we have virtually no data on the background of these children.[*] The production facilities are not of equal quality, but we can make only tautological adjustments, because we have no quality measure which does not appear directly in the cost relationships of the school. That is, we have teacher degrees for fiscal 1970, and teacher experience (average per school) for fiscal 1971. But we have no other teacher quality data.[**]

O'Neill and Holen state:

> ...the time-honored principle of economies of scale....describes the general tendency of costs per unit of output -- in this case, one child's education -- to fall as the scale of operation -- in this case, the size of the school -- increases.

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[*] The 1959 income data has been discussed, above, as well as the percent of needy children. These data are inadequate controls for the important effect of background on any school outcome measure.

[**] We have data on kinds and, to some extent, dates of texts in these schools. We have not had time to incorporate this information into our data file, however.

Is "one child's education" to be measured by the fact that a place in a school is provided for him? Clearly not. We have to have some idea whether his education is equal, not his time in school. We do not have sufficient data to judge, by any definition, whether the education provided in one school is equivalent to that provided in another. However, we do know the gross result of the school's production and the family background and whatever other influences have been at play in terms of standardized achievement tests. We have calculated, from achievement test data supplied by Defendant referring to fiscal 1970 (test date: November, 1969) the average percentile rank of pupils in different areas of the District of Columbia. The percentile rank is based on norms for large cities -- more lenient in ranking than national norms. We give this average rank for the third and sixth grades for the Reading test only (Arithmetic test results are also available) in Table VI-1.

We can see that outcomes are definitely not equal. Schools west of the Park have an average rank twice that of the rest of the city. Within the west of the Park group, our Group II schools have a clear advantage in test scores. Indeed, the average pupil in one of these scores has done better on this test than three-fourths of the children in large cities. The average child in an Anacostia school on the other hand has been bettered by almost two-thirds of the children in large cities. We are not, of course, suggesting that these scores are solely the result of superior schooling. However, the burden is squarely on the Defendants to demonstrate that none of the difference is due to schooling.

TABLE VI-1

Mean Percentile Reading Test Scores*

School Area (number of schools)	Grade 3	Grade 6
Anacostia (34) [a]	35.78	37.38
Title I 20)[b, c, d]	31.54	34.83
Rest of East of Park (56) [e,f,g,h]	39.52	39.21
West of Park (13)	69.92	72.05
West of Park Group I (5)	54.72	57.17
West of Park Group II (8)	74.27	76.11

a) No scores given for Nichols Ave., Grade 6.
b) No scores given for Langston and Perry, Grade 3.
c) No scores given for Poor, Edmonds & Langston, Grade 6.
d) Bundy is omitted because it is a special school.
e) Both Lenox and Lenox Annex are omitted since Lenox Annex is a special school and since the data provided for the two schools could not be separated. Blow-Pierce, Grant and Military Road are also omitted because they are special schools.
f) No scores given for Grade 6 of Amidon, Blair-Ludlow-Taylor Syphax and Tubman.
g) No scores given for Grade 3 of Blair-Ludlow-Taylor, Bowen, Syphax and Tubman.
h) No enrollment data given for Amidon or Hayes.

*The reading test scores are given as the mean ranking according to national large city norms. In each area, the mean per school was weighted by the membership of that school to obtain a true pupil mean for that area. Some error is introduced by using school weights, whereas the number of children in that grade per school should have been used. We do not have this data. These scores seem to come from a 10 percent sample of pupils, not a complete count. We understand that this is so, though defendants did not state this with their submission.

In addition, there are other outcomes of schooling which are important besides test scores. Attitudes toward the world, towards other people, towards oneself, are being recognized as being influenced by school. Are the schools influencing these attitudes randomly? Are these outcomes related to size of school, to area of the District? We do not know. Defendants must be assuming that all District schools are affecting these outcomes equally if they are to assume, as they do, that one child's place in a classroom is a valid measure of educational outcome.

2. Findings on Economies of Scale

The Plowden Report briefly investigated the relationship between school size and cost for primary schools, but did not control for pupil outcome of any kind.*

> "We examined the relationship between the major running costs of a sample of 81 primary schools and their size and age. Building maintenance costs were shown to be related to the age of the school, but not to its size. Cleaning and caretaking costs per pupil showed some tendency to rise with increases in the size of school, and fuel and lighting some tendency to fall, but none of these costs was related to the age of the building."**

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*Children and Their Primary Schools, op. cit., pp. 169-170, Volume I.

**Ibid., p. 169.

The authors question the genuineness of the observed "economy of staffing in very large schools," pointing out that it "will disappear, if as we recommend, schools are staffed on the basis of a pupil-teacher ratio as well as on size of class."[*]

Most studies purporting to be concerned with economies of scale in schooling consider Districts as units.[**] We have found only two studies which consider schools as units: one by Elchanan Cohn, and one by John Riew.[***] Both Riew and Cohn estimate per-pupil expenditure with an equation of the form:

$$Y = a + b_1 S + b_2 S^2 + b_3 X_1 + \ldots + b_n X_n + e$$

where Y is total current cost per pupil in Average Daily Attendance, S is a measure of size (ADA), and the X variables are controls for such things as teacher salary and other "quality" factors. It is doubtful whether school quality is well controlled but at least these authors were aware that it should be.

The two equations differ markedly:

Riew:

$$Y \approx 10.31 - .402S + .00012S^2 + \ldots\ldots$$

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[*] Ibid., p. 170.

[**] See, for example, Werner Z. Hirsch, "Expenditure Implications of Metropolitan Growth and Consolidation," Review of Economics and Statistics, August, 1959, pp. 232-241, or Jerry Miner, Social and Economic Factors in Spending for Public Education, Syracuse University Press, 1963.

[***] Elchanan Cohn, "Economies of Scale in High School Operations," Journal of Human Resources, 1968. John Riew, "Economies of Scale in High School Operation," Review of Economics and Statistics, August, 1966, pp. 280-287. Cohn, it should be mentioned, does use district data, but he deliberately chooses districts with but one high school.

Cohn:

$$Y = 263.46 - .17758 + .0000537S^2 \quad .....$$

To see what these equations mean, we calculate the scale effect at 700 pupils, the average school size for the District of Columbia in fiscal 1970.

Riew: -\$.234
Cohn: -\$.103

At the average size, one estimates as 23¢ savings in per-pupil cost with the addition of one more pupil, the other estimates a 10¢ saving. We cannot try to reconcile these figures -- the data samples and controls were quite different. They both refer to total current costs per pupil, and therefore should be higher than estimates on teacher expenditure only.

In conclusion, economies of scale are claimed to exist in schooling. There is no good estimate of those economies in District schools because there is no adequate control for outcome. The two estimates we have found in the literature diverge by 100%. Our estimate of the effect of scale on per pupil teacher expenditure, given below, cannot explain the variation found within District schools. In particular, as we will demonstrate, it can explain no more than half of the difference between expenditures on schools west of the Park and the rest of the city in fiscal 1970. A reasonable estimate of the actual scale effect might explain one-fourth of this difference.

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[*] We chose that Cohn equation which did not include a direct outcome control, as his test score difference was not significant, and neither Riew nor ourselves have such a control.

It is amazing to us that O'Neill and Holen did not investigate the literature before claiming economies of scale for District schools. It is certainly more amazing that they neglect to ask whether the quality of schooling is reasonably the same in all schools. But it is most disconcerting to see that they made no attempt at all to explain costs by size.

Indeed, if we refer to their bar chart, we see that they are prepared to accept whatever decrease in expenditure accompanies the increase in size, without ever asking whether there might be something else occurring in these schools. It is a kind of statistical nihilsm which assumes that whatever is must be. We will see that a good deal of what is reflects school department discretion, and this discretion favors schools west of Rock Creek Park.

B. ECONOMIES OF SCALE IN D. C. SCHOOLS, FISCAL 1970

We have established that the existence of true economies of scale, i.e., lower costs with equal output for larger producing units, have not been demonstrated by defendants. The defendants have not estimated any actual size-output-expenditure relationship. The literature also indicates the possibility of a negative relation between size of school and achievement.* Although we do not claim that test scores are entirely caused by

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*See Herbert J. Kiesling, High School Size and Cost Factors, U. S. Office of Education, March, 1968, especially pp. 30 and 130. Roger G. Barker, in Big School, Small School (Stanford University Press, 1964) details the negative psychological effects produced by large schools, though again these are high schools. There is one study of this relationship among elementary schools of which we are aware, by Paul Street, James H. Powell, and John W. Hamblen, "Achievement of Students and Size of School," (The Journal of Educational Research, March, 1962). This study involved schools in coal and rural areas of Kentucky. "Large" schools were over 300 pupils, and were possibly better than small schools--many of which were one-teacher schools--though since the study failed to control for either pupil or teacher characteristics, even this result is uncertain.

school, we do note that achievement test scores are significantly higher in those schools in which more money is being spent. In Table VI-2 we show correlations between test scores and per-pupil expenditure in fiscal 1970. We give these correlations with and without the special schools to demonstrate how misleading inclusion of special schools can be. Since special schools are defined essentially by their low pupil scores, and provided with extra funds on this account, a negative correlation is part of the school expenditure design. A positive correlation among other schools could be due to a causal relationship between higher expenditures and higher scores. It could also be due to money following higher social class children who tend to have higher scores. Neither interpretation seems favorable to defendants' position, since we have shown that the high test scores are in schools in Group II west of the park.

It is clear, therefore, that if less per pupil is expended in larger schools it may be that this reflects true economies of scale, but it may equally be that these schools are inferior. To ascertain which is the case, we would need a numerical estimate of the effect of size on expenditures, holding quality constant. We do not possess sufficient data to do this. However we will demonstrate that even by the most generous arguments available from the data, schools west of Rock Creek Park are favored in allocating the D. C. budget, over and above that amount of differential expenditure which can be ascribed to "size". By one set of standards the eight schools west of the park which we have called "Group II" are favored by $43 per child, or well over the 5% difference from the mean being considered.

TABLE VI-2
CORRELATION COEFFICIENTS BETWEEN EXPENDITURE PER PUPIL AND TEST SCORES[a]
Fiscal 1970

Excluding Special Schools
N=123

	Third Grade		Sixth Grade	
	25th Percentile	Mean	25th Percentile	Mean
Teacher Expenditure per child				
Reading:	.148	.123	.112	.090
Arithmetic:	.117	.088	.091	.135
Regular Expenditure per child				
Reading:	.076	.046	.036	.025
Arithmetic:	.049	.025	.021	.075

Including Special Schools
N=128

	Third Grade		Sixth Grade	
	25th Percentile	Mean	25th Percentile	Mean
Teacher Expenditure per pupil				
Reading:	-.171	-.151	-.049	-.082
Arithmetic:	-.171	-.138	+.022	-.008
Regular Expenditure per pupil				
Reading:	-.203	-.193	-.089	-.116
Arithmetic:	-.202	-.174	-.019	-.038

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[a] See notes to Tables VI-4 through VI-6 for explanation of the sample definitions.

We will proceed in the following order. First, we will demonstrate that the O'Neill-Holen article has no statistical validity. Second, we will present a valid statistical method for explaining expenditures. We will show that any economies of scale effect is small, and becomes smaller as other expenditure explanations are considered. We will "explain" several expenditure items by size, presence of special classes, teacher characteristics and capacity utilization (i.e., with and without accepting this utilization as a *fait accompli* with legitimacy in explaining expenditure variation), and present estimates of the discrimination in favor of schools west of the park *whether or not* our argument that capacity utilization should be controlled for is accepted.

1. The O'Neill-Holen article

June O'Neill and Arlene Holen are very explicit: "Variations (in regular D. C. expenditures per pupil) arising from factors other than size appear to cancel each other out." "The reason for this phenomenon of declining costs . . . is the greater spreading out of high fixed costs over more pupils in the larger schools." "There is, however, no evidence of systematic expenditure variation or discrimination east or west of the park..." That is, they claim 1) to have explained a large proportion of the variation in expenditures, 2) to have determined that spreading fixed costs is the culprit, and 3) to have established that the residual variation is random with respect to the park. All three conclusions are incorrect.

For the 128 schools for which we have complete data for fiscal 1970, Average Daily Membership (ADM) alone "explains"

25.7 per cent of the variation in D. C. teacher expenditure per pupil. Excluding the five special schools, ADM alone "explains" 28.0 per cent of the D. C. teacher expenditure per pupil. We are enclosing the word "explains" in quotation marks because, as will be seen below, some of this explanatory power is spurious -- it appears here because size is to some extent correlated with other factors which, when they are accounted for, diminish (but do not extinguish) the explanatory power of the size variable. Size might, however, "explain" a bit more of the variation in expenditures if we account for a nonlinear relationship between size and expenditure. This is logical, as the larger the school, the less impact we would expect -- from O'Neill and Holen's argument about spreading fixed costs -- from further increases in size.

The word "explain" here has a precise statistical meaning. Suppose we had one piece of information, school size, and were asked to predict per pupil teacher expenditure in several schools (with different expenditure figures). Suppose, as size varied, there were a precise and not extremely complex relationship between size and expenditure. Then if we take the best estimate of that relationship, we should estimate the actual expenditure very well from knowing only the size of the school. We need to know size and the relationship between size and expenditure which best estimates expenditure, on the average (that is, over a number of schools). We are given the size. We specify the mathematical form of the relationship, and a calculus technique which has been computerized estimates that particular relationship (equation) which minimizes, on average, the difference between our estimated expenditure and the actual expenditure. By summing the squares of the differences in expenditures among schools from the mean, we have a calculation of the

amount of variation of expenditures. By summing the differences not from the mean, but from our estimate, we presumably get a smaller sum of squared differences. The degree to which this number is smaller than the previous number is essentially what we mean by saying that size (or whatever other factors we have considered) "explains" variation in expenditure. It is a measure of the extent to which knowing a school's size has reduced our ignorance about expenditures per pupil.

If expenditure is related to size by the formula

$$\text{Exp} = \text{Constant} - b_1(\text{ADM}) + b_2(\text{ADM})^2$$

then the ability of size to "explain" cost variation is indeed increased. Table VI-3 presents the percent of expenditure explained, for the expenditure categories, by ADM alone and ADM with $(\text{ADM})^2$ together from the above formulation.[*] We present this information for the fiscal 1970 data set which excludes those schools we have identified as "special."[**]

From Table VI-3 the following points are clear. 1) Size of school does not "explain" most of the variation in any expenditure category. At most, size "explains" one-third of the variation. Inclusion of the special schools reduces the apparent effect of size, because the presence of special students overwhelms any size considerations. 2) Very little reduction of explanatory power appears when teacher expenditures, not D. C. regular expenditures,

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[*] We note here, as above, that this formulation has appeared previously in the literature. See, for example, Elchanan Cohn, "Economics of Scale in Iowa High School Operations," op. cit.

[**] See notes to Tables VI-4 through VI-6.

TABLE VI-3

Percent of expenditure Variation "Explained" by Size (ADM) of School Alone

	128 School including special		123 Schools excluding special	
	ADM	ADM+(ADM)^2	ADM	ADM+(ADM)^2
D. C. Regular Expenditure	27.6	32.0	34.0	34.7
D. C. Regular and Impact	26.8	32.8	31.8	33.7
Teacher Expenditure	25.7	31.8	28.0	28.7

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*All variables are expressed on a per pupil basis.

are used. The assumption that high fixed costs other than teacher costs lies behind this apparent size-expenditure relationship does not seem tenable.

Another simple test of the scale phenomenon is to explain total school expenditures by number of students. If there is a linear relationship, then there are no economies of scale. If there is a nonlinear relationship (of the same form as above), then there are such economies. That is, in the absence of economies of scale, each pupil would add an average amount to the cost of the school. If there are economies of scale, then as the school gets larger, less should be added to the expenditure, as indicated by a negative coefficient for the quadratic term $(ADM)^2$. We can measure the divergence from linearity by asking how much more variation is explained by the scale factor than was explained by the size factor alone. For the three types of expenditure, the increase in the percentage of variation of costs per school explained by a scale factor, over and above having an average cost per child and knowing the size of the school, is as follows:

Regular D. C. expenditures	1.77%
Regular + Impact	.40%
Teacher	1.14%

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*From regressions in 128 schools, results are essentially the same. We note here that the percent of variation explained by size alone, and a fortiori by size and scale, is considerably greater than when per pupil expenditures are at issue. This is as it should be: it is because we expect size to dominate the school expenditure pattern that both sides in this case concentrate on per pupil expenditures.

O'Neill and Holen do not see that more variation lies within their size categories than between them, because they have simply not looked at the data.[*] As a gross example, they show us two schools west of the park in the 500-749 ADM range, with an average expenditure of $611. The fiscal 1970 expenditures on these two schools were:[**]

Lafayette (735)	$515.82
Murch (634)	$720.33

Thus these two schools appear to follow a regular pattern in the bar chart which O'Neill and Holen show us, but in fact one school has expenditures closer to their previous category, and one close to their succeeding category. Though there is no doubt some relationship between school size and per pupil expenditure, this use of grouped data obscures variation which, we shall see, is not random, and is not neutral with respect to the issues in this case. O'Neill and Holen have analyzed the expenditure variation by one factor only. They state, without investigating, that no other factor is important. The fallacy of one-factor analysis can be illustrated by the following example. Suppose we were to look for factors which seem to explain the variation in per pupil teacher expenditures. We will find several which, alone, explain as much (or nearly as much) as size, alone. We choose the following four, which have the virtue of plausibility and great explanatory power:[***]

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[*] It appears that they did not look at the September 1st show-cause order, either, or they would have analyzed per pupil teacher expenditure, not the D. C. regular expenditure.

[**] From defendants' submission of August 21, 1970.

[***] Based on 128 schools including special. Without special schools, capacity utilization "explains" 42.3%, Teacher/pupil ratio 34.3% of the variation in regular expenditures per pupil.

Capacity utilization (ADM/Capacity)	36.4
Teacher/Pupil ratio	56.2
Special Schools	40.1
Percent special students	28.5

If these are our estimates of the amount of variation which these factors explain, then, together with size, they explain over 190 percent of the variation in per pupil teacher expenditures!

Two things are demonstrated by this example. First, clearly a more sophisticated approach which apportions variation among explanatory factors is required. The analysis can get nowhere by looking at just one factor alone. Secondly, it is clear that the amount of variation "explained" by any factor in this simple one factor analysis is too high. These five factors simply cannot explain 190 percent of the variation in expenditures. Thus the estimate that size alone explains 30 percent of the variation in school expenditures is clearly exaggerated. If we were to actually apportion variation among explanatory variables, we would find that size may explain approximately half the variation attributed to it alone (about 15% of variation in expenditures), and uniquely--that is, subtracting that variation which may also be explained by other factors--explains again half as much, or only 7.5 percent of the variation.*

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*The 15% figure comes from multiplying a beta coefficient for size by the correlation coefficient between size and per pupil expenditures, in a complete regression equation. Derivation of the 7.5% figure is described below.

2. Analyzing School Expenditures

We will here estimate a decision function for expenditures per pupil in Washington, D. C. schools in fiscal 1970. By "decision function" we do not mean to imply that the superintendent of District schools can autonomously determine how to spend school funds; i. e., we do not exclude the possibility of some market process or other conflict of which we observe only the resolution. However it is of basic importance to differentiate this estimation from a "production function" in which an output of schools is being determined by inputs into the school production process. Rather, we are estimating the interrelationships among inputs affecting costs, as these relationships have been worked out by whatever process is involved, and whatever differences in output among schools may result.*

The procedure followed is essentially a mathematical simulation. We will estimate, from the data, that equation which best explains variation in per pupil teacher expenditure, where "explains" has the meaning described above. This equation, then, will estimate, for any school, that school's expenditures, given whatever information (variables) the equation requires. The kind of information we utilize is discussed below. From the data submitted to it on the expenditures and this other information, and given our specification of the mathematical form of the relationship, the computer estimates by least squares regression that set of parameters which, together

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*For more information on production functions see Samuel Bowles, Educational Production Functions, Report to the U. S. Office of Education, February, 1969. For a technical discussion of production function estimation, see Stephan Michelson, The Existential Reality of Educational Production Functions, U. S. Office of Education, August, 1970.

with the variables, best explains variations in the expenditures.* The data all refer to fiscal 1970, from submissions of the D. C. schools to the United States District Court, District of Columbia. We have been able to put together usable files for 128 elementary schools, of which five are "special."**

We tested equations in two forms: in one, these special schools were included, but separated from the other schools by a binary variable. (This variable has the value 1 for these five schools, and 0 for all other schools). In this type of equation, the value of the Special Schools coefficient indicates how much more was spent, per pupil, in a Special School, in fiscal 1970, accounting for its size, and whatever else is in the equation. The relationship between cost and size and the other variables for these schools has influenced the other coefficients, however. In the other form of the equation, we exclude the Special schools from the estimation. (Since non-special schools have special students, we still consider a variable for "Percent of Special Students.") We give up an estimate of the net effect of being a special school, but we gain validity in our other coefficients, since being a Special School obviously dominates any other characteristic in determining expenditures. It is these latter estimates which we show.

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*For an explanation of least squares regression see, for example, James S. Coleman, et al., Equality of Educational Opportunity, U. S. Office of Education, 1966.

**See Chapter IV for a discussion of special schools. For details on missing schools, see notes to Tables IV-4 through IV-6.

It is important to realize how different these special schools are from the others. We have nothing but praise for the obvious efforts put into these schools in fiscal 1970.* We have no enthusiasm, however, for defendants' attempt to include these schools in East of the Park averages. Here are the average D. C. Teacher expenditures per pupil for these schools:**

Bundy	$1,472.02
Military Road	1,416.65
Lenox Annex	657.57
Grant	1,300.03

Our regression results here are by and large insensitive to the inclusion or exclusion of these schools, since we differentiate tham by means of a Special Schools variable. The other variables in the analysis are as follows:

TEAEXP	Teacher expenditure per pupil
ADM	Average Daily Membership
SPEC	Binary variable for special schools
PERSP	Percent special students per school
PERMM	Percent of teachers per school who are permanent with a Masters, Masters plus thirty credit hours, or Doctorate degree
PROM	Percent of teachers per school who are probationary with a Masters, Masters plus thirty credit hours, or Doctorate degree.

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*We are disappointed that this effort apparently has not continued into Fiscal 1971. Data for Pierce alone are not available.

**Data for Pierce do not come separated from data on the Blow school.

CAPUT	Capacity utilization: ADM divided by school capacity
MODEL	Binary variable denoting schools in Model Schools division
RC1	Schools west of Rock Creek Park which are majority black, plus the Key School
RC2	Schools west of Rock Creek Park which are majority white, except the Key School.

Other variables were defined in preliminary trials, but are not utilized here because they were not significantly related to any expenditure measure.

The question of which variables to enter into an expenditures decision function raises the problem of legitimacy. This is best explained by example. It will be true that costs are related to capacity utilization. This relationship is strong and negative: the heavier the utilization, the lower the per pupil costs. But capacity utilization is itself directly under the control of the D. C. Superintendent of Schools. In asking whether the Superintendent favors schools west of the park, it is not sensible to control out of the equation the *means* by which he does this. It is like asking a football coach to ignore the size of his players in choosing his starting team. While we recognize the concept of a smaller player being better *given his size*, football games are won or lost as they are played. A coach may recruit heavy players and win. A Superintendent may underutilize certain buildings and thereby favor them in per pupil cost. The team does win, the schools are favored.

Thus when investigating the net effect of being in Group I or Group II schools, the proper equation to consider accounts only for size, percent special, and the compensatory efforts in the Model Schools. Whatever variation in cost is produced by varying capacity utilization by area is a decision which, as we have documented in Chapter V, need not have been made. We should also know the experience and degree status of teachers, though we should not control for these items in determining the effect of being in a Group I or Group II school. In the extreme, if we accounted for all the mechanisms by which these schools are favored, there would be no residual variation accounted for by the binary variables RC1 and RC2. This would not indicate, of course, that these areas are not favored. Rather, this would have accounted for the ways in which these schools are favored.

It should be clear, therefore, that in investigating the effects of size, all possible discretionary discrimination should be accounted for. This is the complement of the argument immediately above, that in investigating the effect of being in a school west of Rock Creek Park, no other discrimination should be separately accounted for. The proper equation from which to estimate the effect of size would be that in which teacher experience--on which we do not have fiscal 1970 data--is included with teacher degrees and capacity utilization.* One should refer to Table VI-4 for information on the differential financial resources going to Group II schools, to Table VI-5 if he believes that capacity utilization is not within the discreation of the Superintendent of Schools, and to Table VI-6 for our best

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*Strictly speaking, the proper regression equation estimating favoritism towards schools west of Rock Creek Park should constrain the coefficients of the size variables to their values from the fully specified equation. By not doing so, we have estimated a smaller impact for those areas than they should actually show. Given the time period within which this Report was produced, we are unable to make these estimations.

estimates of the effect of size on per pupil teacher expenditures. One would also utilize this table if he believed that teacher degree status and capacity utilization are both out of the control of the Superintendent. We do not present estimates controling for teacher experience because we do not have fiscal 1970 data on this item.

3. A Note on Teacher Experience

The question of whether teacher characteristics should be considered as reasonable explanations is before this court. We have been involved with this issue for some time, and have consistently felt that school boards have not justified excluding differential pay for experienced teachers from measures of inter-school comparability.* This is true not because there is independent evidence that experience is productive -- though, for the intitial years, this does seem to be the case -- but because school managers must value this experience to pay for it. The same argument, after all, could apply to degree status of teachers: we have no certain evidence that teachers with more letters after their names are better than teachers with fewer letters; but in this case school boards have agreed that they are paying for value. The D. C. Superintendent wants to correct for experience only. This raises only a slight problem here, because we have never received data for fiscal 1970 with years of experience per school. (The fiscal 1971 data which does contain this information, on the other hand, does not give us degree status of the

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*This has been noted above, in Chapter III.

teachers). The schools may contend that we should control for (eliminate the influence of) teacher experience, and we will be happy to make that effort, if they will provide us the data in the interests of refining our estimate on the effect of size on expenditures.

4. Regression Results: An Overview

We will separate out three areas of the city with binary variables: the Model Schools area, and the two sets of schools west of Rock Creek Park. Our hypothesis is that there will be a positive and significant coefficient for the variables RC2 and RC1. Such coefficients will indicate that, after controlling for legitimate expenditure variation, schools which we defined on racial and geographic criteria alone are favored in expenditures. We will find that this is true when only ADM and special students are accounted for. We will find that this continues to be true when teacher degree status and capacity utilization are accounted for. In addition, we will find and demonstrate that the apparent effect of scale diminishes as other variables in the equation are entered. That is, some of the cost differential which appears to be due to size is in fact better related to other variables. We will project that decline to what we consider to be a reasonable figure, one which we might obtain in a thorough study.

In Tables VI-4 through VI-6, we present the coefficients, T-ratios, and R^2 for several equations.* The information in these tables is organized to

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*A T-statistic is a measure of a coefficient's statistical significance. A value of 1.96 or better usually indicates significance at the 5% probability level (chances being only 1 in 20 that this result would occur when no relationship, in fact, existed). For variables about which there has been a prior hypothesis as to sign, a T statistic of 1.64 is required for 5% probability, and 1.28 for 10% probability, given the sample sizes utilized here.

demonstrate the effect of each variable, controlling for the others, on the last line of each sub-table. In preceding lines, variables have been entered one at a time, always starting with the measure of size of school which is indicated. It is intended that one should be able to see the relationship between size and per pupil expenditures as different variables are accounted for. In fact, because of the quadratic form of the size relationship, this is somewhat difficult. Therefore we have taken the average size school (700 pupils), and calculated the scale effect at that mean. We note that the scale effect diminishes as schools grow larger. One can easily calculate the effect at any size school from the formula:*

$$\text{Size Effect} = b_1 + 2b_2(\text{Size})$$

where b_1 is the coefficient of ADM, and b_2 is the coefficient of $(\text{ADM})^2$. The sign of b_1 is always negative, and of b_2 is always positive. The effect of scale at mean school values is given in the first column of each table for which it is relevant.

Looking first at the first column, the effect of scale, we see, as announced above, that it diminishes as other variables are entered into the equation. We will return to this subsidiary issue

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*This is the first derivative of the estimated function with respect to size.

later. It should be clear that the defendants' case for economies of scale, while both plausible and possible, has been highly exaggerated. We will repeat once more that no such case can be made without claiming that equal quality of education is produced at these lower costs.

The more important information found in these tables is that the Group II schools west of Rock Creek Park are definitely favored in expenditures. The Model Schools, we note, are similarly favored. About one-half of the variation in expenditures among District schools can be explained by the measures used here. Anacostia schools are not different in these expenditure relationships from the majority of schools in the city -- and by that virtue, are mistreated with respect to schools west of the park. We emphasize that the sole criterion for separating schools west of Rock Creek Park into two groups was Percent Black. In addition, Key was added to the "black" group both because the defendants had picked it out, and because current data does not distinguish between Hardy and Key. Thus this strictly _a priori_ grouping turns out to have statistical validity in these tables.

This is the general picture: Size does explain a part of the expenditures, as do special students. These we take for argument's sake to be "legitimate" parts of the decision functions here estimated. Even if one controls for less legitimate factors, such as capacity utilization and teacher degree status, Rock Creek Group II schools are favored. The rest of this chapter explores these tables in detail.

5. Explaining D. C. School Expenditures, Fiscal 1970

Our basic regression results are contained in Table VI-4 through Table VI-6. Table VI-4 asks the question: accounting for size and percentage of

special students, and not considering special schools, is our hypothesis (that schools west of the park are favored) correct? The answer is "yes". Group II schools average $34 per student more than other areas of the city, and Group I schools a surprising $56 more.* Model Schools also are favored, but since this is a deliberate compensatory program, all is well. We find that schools west of Rock Creek Park are favored equally with the compensatory Model Schools, compared with the rest of the city.

In Table VI-2 we control for capacity utilization. This would give a proper estimate of the favoritism to west of Rock Creek Park schools if, for example, one accepted population shifts without more correction by bussing than is already in effect.** In this case, Group II schools west of Rock Creek Park are favored by $49. Capacity utilization seems to explain most of the difference between Group I schools and the rest of the city, the variable for which becomes insignificant and is not included in this or the next table. However, given their capacity utilization, the equation would expect expenditures in Group II schools to be lower than did the previous equation, and therefore accords to the Group II binary variable a larger coefficient than did the equation in Table VI-4. Capacity underutilization may explain some of the difference between Group II schools and the rest of the schools, but controlling for that, Group II schools are still highly favored.

In Table VI-6 we have accounted for utilization of capacity and teacher degree status. Schools in Group I have no additional advantage over the

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*These figures are significantly different from 0, but not from each other. Both figures are outside the 5% range from the mean.

**That is, the capacity figures are after bussing. The variable is merely ADM divided by capacity rating.

TABLE VI-4

D. C. TEACHER EXPENDITURES PER PUPIL, FISCAL 1970*
Based on 123 Schools Not Special

Effect of Size	Regression Coefficients						
	ADM	$(ADM)^2$	PERSP	MODEL	RC2	RC1	CONSTANT
-.153	-.153						586.79
-.157	-.241	.00006					613.27
-.135	-.163	.00002	17.44				565.05
-.130	-.172	.00003	17.95	33.76			562.91
-.127	-.164	.00003	17.53	35.41	25.64		557.11
-.100	-.110	.00000	17.99	37.88	33.62	55.96	532.20

T Statistics						
ADM	$(ADM)^2$	PERSP	MODEL	RC2	RC1	R^2
6.868						.281
2.825	1.067					.287
1.992	0.472	4.238				.381
2.112	0.618	4.368	1.472			.392
1.985	0.553	4.227	1.536	0.834		.395
1.197	0.0219	4.338	1.643	1.077	1.326	.405

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*See notes at end of tables.

TABLE VI-5

D. C. EXPENDITURES PER PUPIL, FISCAL 1970[*]

Based on 121 Schools Not Special

Effect of Size	Regression Coefficients							Constant
	ADM	$(ADM)^2$	PERSP	CAPUT	MODEL	RC2	RC1	
-.158	-.158							591.99
-.168	-.252	.00006						620.54
-.131	-.173	.00003	16.84					571.96
-.100	-.114	.00001	10.52	-1.91				711.90
-.094	-.122	.00002	11.06	-1.89	28.90			708.24
-.094	-.108	.00001	98.40	-1.96	31.54	48.79		704.87

T Statistics							
ADM	$(ADM)^2$	PERSP	CAPUT	MODEL	RC2	RC1	R^2
7.04							.294
2.95	1.14						.302
2.10	.54	4.07					.389
1.46	.21	2.56	4.39				.476
1.57	.34	2.69	4.36	1.35			.484
1.39	.25	2.37	4.53	1.48	1.61		.495

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[*] See notes at end of Tables.

TABLE VI-6

D. C. TEACHER EXPENDITURES PER PUPIL, FISCAL 1970

Based on 121 Schools Not Special

Regression Coefficients							
ADM	PERSP	PERMM	PROM	CAPUT	MODEL	RC2	Constant
-.158							591.99
-.130	17.21						558.31
-.130	17.64	154.83					539.35
-.130	17.87	161.71	193.39				532.70
-.098	11.27	139.20	297.44	-1.94			683.05
-.096	11.82	143.20	255.67	-1.91	25.40		677.06
-.091	10.61	126.50	273.28	-1.98	27.21	43.22	678.44

T Statistics							
ADM	PERSP	PERMM	PROM	CAPUT	MODEL	RC2	R^2
7.045							.294
5.932	4.225						.387
5.997	4.387	2.078					.409
6.017	4.435	2.160	0.974				.414
4.616	2.814	2.148	1.606	4.518			.502
4.552	2.936	2.063	1.359	4.454	1.193		.508
4.189	2.592	1.805	1.456	4.610	1.281	1.429	.517

Note: $(ADM)^2$ added to this equation would raise the final R^2 to .518. However this variable would be insignificant (T =.537). See additional notes at end.

NOTES TO TABLES IV-4 THROUGH IV-6

Schools eliminated from all estimates due to incompleteness of data:

Amidon
Blair-Ludlow-Taylor
Hayes
Madison
Morgan
Morgan Annex
Sumner
Tubman

In addition,

Orr
Oyster

were eliminated from estimates in which teacher degree status was involved, for lack of data. The following schools were eliminated from estimates of non-special schools:

Bundy
Grant
Lenox Annex
Military Road
Pierce

In such estimations,

Blow

was also eliminated, because data came combined with Pierce.

Data came from various tables and submissions, in all cases provided by the District Schools, and in all cases the latest revisions to November 27, 1970.

of the city when we account for their teacher's degrees and their capacity utilization. Model Schools are about at the limit of the 5 percent range, and Group II schools are favored by $43. Most of this seems due to teacher experience in these schools. In otherwise the same equation, substituting pupil-teacher ratio for capacity utilization, Group II was favored by only $30, Model Schools by $24, over the rest of the city. In both sets of equations the apparent effect of size is greatly reduced when other factors are accounted for.

6. Calculating the Effect of Size

The data in these tables are arranged as follows. Each table is divided into two parts. In the top part the coefficients present actual dollar-per-pupil estimates of the effect of the variable indicated by the column head. Thus, for example, the first line of Table VI-4 accounts for size (Average Daily Membership) only. The coefficient -.153 says that for every pupil added, the cost per pupil declines by 15.3¢. This can be quite a lot of money. Consider a school with 500 pupils which adds 100 more. Then the 15.3¢ saving per pupil added is $15.30 per pupil; and times the 500 pupils initially there, this comes to $7,650 savings for the school. This we can take to be the naive estimate of the economies of scale offered by the defendants.

In the second line of Table VI-4 we introduce the quadratic term. Because it is difficult to interpret the combined effect of two terms, we have calculated, as promised, the effect of scale at 700 ADM. It is about the same as was our initial estimate. At each

row we add one more variable. The last row in each Table is the estimate of the full equation. The PERSP column indicates the additional dollar spent as the percentage of special students increases by 1 percentage point. The variables for Model Schools and west of the park indicate the dollar advantage, holding ADM and percent special constant, of just being in one of these schools.

The bottom half of each table gives T statistics and R^2. The T statistic, as has been explained, is an indication of the chance of finding this coefficient if it were in fact, on average, zero. All coefficients except those for $(ADM)^2$ should be considered significant. $(ADM)^2$ is included because, when it first enters, it might be considered significant, but this effect is spurious, as the addition of subsequent significant variables demonstrates.

The variable for scale diminishes by approximately one-third of its initial value. There remains, nonetheless, a scale factor of 10¢. It would require a variation in scale of 250 pupils for scale to account for a $25 per pupil difference between schools. A variation of 500 pupils would account for the difference between schools at either extreme of the 5% range. The smallest school in fiscal 1971 is Jackson, with 99 pupils; the largest is Hendley (and annex), at 1,845. The difference between these two schools is 1746 pupils. Calculating a (generous) size factor of 10¢ per child would account for $174.60 per student difference. The data are not available for Jackson separately for fiscal 1971, but comparing the Hyde-Fillmore-Jackson expenditure with Hendley, a difference of $520, we see that the difference in size can account for no more than one-third the expenditure difference. We do not deny that this is a considerable effect of size. It is a more considerable effect of discretionary behavior by the Superintendent. In addition, the actual

effect of size may be far less--we estimate one-half that indicated here.

When we continue to add variables, the size coefficient diminishes further, down to 9.1¢ per child in Table VI-6. We have not controlled for one major determinant of expenditure, teacher experience. Should we do so, the size coefficient would probably greatly diminish. We cannot be completely certain that this would be the case, since there are experienced teachers in both the Anacostia (low expenditure) and Group II (high expenditure) schools. However, it is difficult to believe that additional variables will not reduce further the apparent size-expenditure relationship.*

Most importantly, as stressed above, we find it hard to believe that the schools in the city in general are as good as the schools west of Rock Creek Park.** We must subtract from the size-expenditure relationship enough to make the large schools equivalent in quality to the small schools. We can only measure quality from observations on the children, and this is a difficult research task. It involves finding out what skills and attitudes the children had when they entered school, what they had when they left, and whether they acquired the additional skills in school or as a result of being in school. With the proper information, and with the size coefficient steadily decreasing (in absolute value) with each addition to the equation so far, we would put an upper limit of 7¢ per child as a true scale effect. We think a more reasonable

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*We did introduce pupil-teacher ratio into the equation, and, though it is claimed to be a function of size, we found it and size both to be significant. This parallels results found in the next chapter, where we show that pupil-teacher ratios vary systematically after accounting for size. This systematic variation in pupil-teacher ratio obviously accounts for some variation in expenditures, though it increased the amount of variation explained by only .8 percentage points (increased R^2 by .008). For present purposes, the most important thing to notice is that the ADM coefficient fell to -.086, or another 1/2 cent per child.

**If teacher degree and experience were the only determinents of differential school quality it would be redundant to control for them and for outputs directly. But doubtless this is not the case, and defendants even argue that there is no redundancy between teacher experience and school quality.

estimate might be 5¢. However, at this point any estimate in the range 5¢ to 7¢ has about equal standing.

We choose the lower estimate because of the results from the next chapter. There we find that pupil-teacher ratios are higher in Anacostia schools than elsewhere, adjusting for size. Anacostia schools are larger than average--with several schools over 1000 pupils--and, if we can tell anything from the test scores, worse than average. If it is true that these schools are inferior--and enough parents believe this is so to demand that their children be bussed to west of Rock Creek Park--then the size coefficient must fall by quite a bit. It is also possible to find in the literature, as we have pointed out, that large schools are inferior to small schools in general. An adequate production function for elementary schooling would still no doubt find, as defendants claim, an effect for economies of scale. This should be considered in any calculation of appropriate school costs. However, a proper calculation of the real scale effect, holding educational output constant, would, we think, be in the area of 5¢ to 7¢ per child, and more likely towards the bottom end of that range.

We will make one last observation about these regressions. The size variables "explained" 28% of the variation in expenditures per pupil themselves. Our most complete equation from Table VI-6 explains 52% of the variation. How much of that can be uniquely attributed to size? An answer is found by estimating the amount of variation explained by the other variables in the equation, without the size variables.[*] These variables can account for

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[*] See also, for example, James S. Coleman, Equality of Educational Opportunity, op. cit. See also R. G. Newton and D. J. Spurrell, "A Development of Multiple Regression for the Analysis of Routine Data," Applied Statistics, Volume 16, No. 1, 1967, pp. 51-64.

over 44% of the variation themselves, leaving 7.5% "uniquely" attributable to size. Thus saying nothing about economies of scale, size of school may unambiguously be said to account for one thirteenth of the variation in per pupil teacher expenditures among District schools in Fiscal 1970.* Hardly the magnificent explainer claimed by June O'Neill, Arlene Holen and defendants!

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*As noted above, there is a technique to apportion all the variance explained among the explanatory variables. This calculation, however, prorates joint variance equally among the explanatory variables according to their unique explanations. Such a technique gives to size the estimate of explaining about 15% of expenditure variation.

APPENDIX

The estimation technique used here is multiple regression analysis. This technique is common enough not to require elaborate discussion.* However, as we find that it is not always used carefully, some discussion is in order. Usually a population sample is taken, and an equation of the form

$$Y = a + b_1 X_1 + b_2 X_2 \ldots + e$$

is estimated, where Y is the variable being explained (school costs per pupil), and the X are variables which relate to costs, such as size, characteristics of teachers, etc. The e in the equation is an error term, presumably distributed randomly, reflecting variation in Y not explained by the rest of the equation. There are several sources of this variation, including the fact that the linear form may not describe the process being investigated, the data may have been observed with error, the sample may not truly reflect the population.

In the case at hand, we have not sampled, but, except for missing data, we are considering the entire population of interest. Furthermore, we are dealing with accounting-type data, not response to survey questions, observations of behavior, or other typical error

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*See for example, Equality of Educational Opportunity by James S. Coleman et al., U. S. Office of Education, 1966.

generating processes. In such a case, except for errors from estimating the wrong functional form, we have exact measures. If two mean measures are calculated from entire populations, and these means differ by any amount, and there is no measurement, coding, etc. error, then this difference in means is "significant" no matter what the variation around the means in the populations. We have an exactly analogous case here, and one could contend that measures of significance in our coefficients are meaningless. That is, we should accept any coefficient which is"large" in an educational or practical sense, regardless of the variation we observe around that coefficient. Our argument would not be affected by such a procedure. However, we reject this view in favor of the following one: We are taking these data as a sample of the many "D. C. school systems" which the Superintendent might manage, and in which the forces of conflict over school policies might be like this one. True, we only observe one such system at any time, but, as the frequency of data revisions submitted by the Corporation counsel shows, this one system is in great flux. It cannot be said to be in stable equilibrium. Thus both because this set of data does not reflect the final values of this system, and because this system can be seen as a sample of similar (though imaginary) systems, we will accept statistical tests of coefficients.

We use one-tailed tests on all of these coefficients. That is, it is our hypothesis that these coefficients will have particular signs. If they have the opposite sign, they are rejected.

More probability space is assigned to the sign we expect,

and it is therefore "easier" for a coefficient to be significant with a one-tailed test than with a two-tailed test. Following is a list of independent variables with our hypotheses:

RC1	positive
RC2	positive
MODEL	positive
ANAC	negative
ADM	negative
$(\text{ADM})^2$	positive
CAPUT	negative
PERSP	positive
PERMM	positive
PROM	positive
PUPTEA	negative

CHAPTER VII

EXPLAINING DIFFERENCES IN TEACHING EXPENDITURE PER PUPIL

In this chapter we will demonstrate that differences in both pupil-teacher ratios and average teacher costs contribute to the overall favoritism shown schools west of Rock Creek Park. We will determine what percentage of the difference between schools west of the Park and the rest of the city is due to each of these factors. We will also discuss Defendants' argument that

> Teacher-pupil ratios do not vary in relation to the economic level of the school. Teacher-pupil ratios do vary in relation to the size of the school enrollment because of difference in enrollments per grade in larger and smaller schools.*

We find that the teacher-pupil ratio is not stable over areas of the District. As in Chapter VI, we do not know if this is a result of technology or discretion. We will find that, after correcting for size of school, there remains an effect of socio-economic class. Specifically, schools in Anacostia will be seen to suffer higher pupil-teacher ratios than schools in the rest of the city, controlling for ADM.

With these two findings -- teacher-pupil ratio contributes to teacher cost differences, and teacher-pupil ratios are an erratic function of size and a significant function of social class -- we will conclude our basic argument. Chapter VIII will then invest-

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*Defendants' Memorandum November 17, 1970, P.42.

gate the consequences of 5% equalization, and Chapter IX will summarize this research memorandum.

A. Differences Between Areas of the City

We have demonstrated that there are differences in teacher expenditure per pupil between regions of the District. Two variables--teacher salaries and pupil teacher ratio--completely explain variation in teacher expenditure per pupil. We have calculated the amount of the difference between two areas of the District explainable by each of these variables. This information is presented in Table VII-1. Taking the first row, for example, this table reads as follows:

In fiscal 1970, teacher expenditures west of Rock Creek Park averaged $551.80, to $419.58 in the area east of the Anacostia River. The expenditures are 31.5% higher west of the Park than in Anacostia. Of the $132.22 difference, 45.0 percent can be explained by higher teacher salaries, 48.2 percent can be explained by lower pupil-teacher ratios, and 6.8 percent can be explained by the interaction of these two elements, but by neither of them alone.*

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*These results are not affected by findings in the previous chapter regarding possible economies of scale. We are not dealing in this chapter with the cause of the differences observed in pupil-teacher ratio or teacher salaries. To the extent that there is a technological relationship between either of these factors and scale of operations, then the differences in scale can be thought of as ultimate causes of the factors analyzed here. Given the correlation between pupil-teacher ratio and size of school (.411 for our 123 school sample), and the failure of Defendants to establish a technological relationship, either pupil-teacher ratio or scale could be the more basic cause of the other's observed relationship with teacher cost per school.

TABLE VII-1

Sources of the Differences in Per Pupil Teacher Expenditures Between Areas of Washington, D.C.[a]

				SOURCES OF DIFFERENCE		
	Anacostia	West of the Park	West of the Park[b] Advantages	% Explained by Higher Salaries	% Explained by Lower P-T Ratios	% Explained by Interaction
fiscal '70	419.58	551.80	31.5%	45.0	48.2	6.8
fiscal '71	446.03	642.91	44.1%	38.4	53.4	8.2
	Remainder of City	West of the Park	West of the Park[c] Advantages			
fiscal '70	446.19	551.80	23.7%	66.2	29.2	4.6
fiscal '71	495.14	642.91	29.8%	47.9	45.6	6.5
	Anacostia	Remainder of City	Advantage of Remainder of City[b]			
fiscal '70	419.58	469.07	11.8%	-7.3	108.1	-.8
fiscal '71	446.03	533.04	19.5%	23.0	75.1	1.9

[a] Model schools are included in these calculations.

[b] The Anacostia figure is taken as the base of the percentage.

[c] The Remainder of the City figure is taken as the base of the percentage.

1. The Procedure

The procedure for explaining the $132.22 difference in expenditures may be explained as follows. Suppose Anacostia pupil-teacher ratios were held constant but Anacostia teachers were paid West of the Park salaries; teacher expenditures per pupil as a result of this procedure would then be $479.04 in Anacostia. Thus $59.46 ($479.04 - $419.58 = $59.46) or 45.0% ($59.46 ÷ $132.22 = 45.0%) of the overall difference can be explained by the difference in teacher salaries.

Likewise if Anacostia teacher salaries are held constant, but pupil-teacher ratios are reduced to those west of the Park, teacher expenditures in Anacostia become $483.29. Thus $63.71 ($483.29 - $419.58 = $63.71) or 48.2% of the overall difference can be explained by pupil-teacher ratios. The remaining 6.8% (i.e. 100% - (45.0% + 48.2%)) is explained by the interaction of teacher salaries with pupil-teacher ratios.

In more precise terms, the calculation procedure is as follows:

Let P = number of pupils
T = number of teachers
C = total cost of teachers

Schools west of the Park will be designated by subscript $_w$

Anacostia schools will be designated by subscript $_a$

Thus $\frac{C}{P}$ = teacher cost per pupil

and $\left(\frac{C}{P}\right)_a$ = teacher costs per pupil in Anacostia.

In general

$$\frac{C}{P} = \frac{T}{P} \cdot \frac{C}{T}\text{ ,}$$ an algebraic identity,

and

$$\left(\frac{C}{P}\right)_a = \left(\frac{T}{P}\right)_a \cdot \left(\frac{C}{T}\right)_a$$

Let

$$\left(\frac{C}{P}\right)_a' = \left(\frac{T}{P}\right)_a \cdot \left(\frac{C}{T}\right)_w$$

This can be viewed as the teacher cost per pupil if Anacostia pupil-teacher ratio remained the same, but Anacostia teachers were paid west of the Park salaries.

The contribution of teacher salaries toward the lower teacher expenditures per pupil in Anacostia is then

$$\frac{\left(\frac{C}{P}\right)_a' - \left(\frac{C}{P}\right)_a}{\left(\frac{C}{P}\right)_w - \left(\frac{C}{P}\right)_a}$$

Likewise, let

$$\left(\frac{C}{P}\right)_a'' = \left(\frac{T}{P}\right)_w \cdot \left(\frac{C}{T}\right)_a$$

This can be viewed as the teacher cost per pupil if Anacostia teacher salaries remained the same, but the pupil-teacher ratio was lowered to west of the Park ratios.

The contribution of pupil-teacher ratios to the lower teacher expenditures per pupil in Anacostia is then

$$\frac{\left(\frac{C''}{P}\right)_a - \left(\frac{C}{P}\right)_a}{\left(\frac{C}{P}\right)_w - \left(\frac{C}{P}\right)_a}$$

There is no reason to expect the sum of these two calculations to equal 100%. The difference in expenditures will always be the sum of the amount due to an increment to one of two factors, the amount due to the increment in the other, and the amount due to the fact that both factors are incremented together.

2. The Results

In general, we have discussed the area west of Rock Creek Park vis-a-vis the rest of the city. The calculations for this comparison appear in the middle of Table VII-1. We see there, first of all, that the area west of the Park has increased the difference in per pupil teacher expenditures from $106 to $148 (rounded). One could see this as an increase by one-third in the advantage of pupils west of the Park. However, we have calculated advantage on a relative basis, that is, accounting for the fact that expenditures increased overall between these two fiscal years. There still is an increase in favoritism shown to pupils west of the Park, whose per pupil teacher expenditures are now 30 percent above the rest of the city.

Following the procedures detailed above, the percent by which west of the Park expenditures would be reduced to those of the rest of the city by equalizing (at rest of the city levels) salaries and pupil-teacher ratios are given also in Table VII-1. In both years, both higher salaries

and lower pupil-teacher ratios contributed to the resource advantage of children west of the Park. There is surprisingly little interaction here, that is, difference in expenditure which cannot be explained uniquely by one or the other factor. The division between the explanatory factors did change in the two years. In fiscal 1971, considerably more of the difference is explainable by lower pupil-teacher ratios west of the Park. The increase in the expenditure difference, noted above, occurred almost entirely by reducing the pupil-teacher ratio. The relative salaries stayed just about the same, as can be checked from figures in Tables II-1 and II-2. Thus teachers west of the Park are paid as much more than teachers elsewhere in fiscal 1971 as they were in fiscal 1970. However, they are in addition advantaged by a lower pupil-teacher ratio, which now explains about half of the difference in expenditures between schools west of the Park and the rest of the city.

The first part of Table VII-1 requires little additional discussion. The difference between west of the Park schools and Anacostia schools is even greater than between west of the Park and the city (excluding west of the Park schools), because expenditures in Anacostia are below average. In fiscal 1971, on a per pupil basis, schools west of the Park spent close to 50% more than schools in Anacostia. This was a greater difference, in dollars or in percentage terms, than in fiscal 1970.

The bottom part of Table VII-1 compares Anacostia with schools in the rest of the city (including west of the Park). In fiscal 1970, salary differences explain a negative amount of the difference in average per pupil teacher expenditure. That is, in fiscal 1970, per pupil teacher expenditures were smaller in Anacostia than in the rest of the city *even though*

Anacostia teachers were more highly paid than the city-wide average. Thus, had the pupil-teacher ratio been equal, Anacostia would have had *higher* than average per pupil expenditures. Since the rest of the city average is taken as a base, the result is that differences in pupil-teacher ratio explain over 100 percent of the differences in expenditures. Salaries in Anacostia did increase in fiscal 1971, but not as much as in the rest of the city. Thus Anacostia salaries are now below the city-wide average, though a higher pupil-teacher ratio still explains most of the amount by which Anacostia expenditures are below those of the rest of the city. This amount increased in both dollars and percent over these two years.

In sum, this table tells the following disturbing tale: Relative to the rest of the city, pupils west of Rock Creek Park are more advantaged in fiscal 1971 than in fiscal 1970. Relative to the rest of the city, pupils in Anacostia are more disadvantaged in fiscal 1971 than they were in 1970. This is true in percentage terms, and even more true in dollar terms. The advantage of the schools west of the Park can be explained about equally between higher teacher salaries and lower pupil-teacher ratios. The disadvantage of Anacostia schools can be explained mostly by higher pupil-teacher ratios.

B. The Pupil-Teacher Ratio

Defendants claim that the pupil-teacher ratio differences observed above are themselves due to size variation. Specifically, they pose a technological argument: in small schools there are fewer opportunities for optimal arrangements (average pupil-teacher ratios), and they choose a lower ratio when they must. We will investigate the claim that size alone accounts for variation in pupil-teacher ratio. We will find this claim to be false. We

will investigate the claim that, accounting for size, there is no difference in pupil-teacher ratio among areas of the city. We will find this claim false also.

We will investigate the scatter-diagrams defendants submitted in reference to their claim that size explained the pupil-teacher ratio variation. We will find this graphic demonstration questionable. We will, finally, present data on the degree level of teachers west of the Park and in Anacostia, showing a marked difference.

In their November 17th submission, defendants present new pupil-teacher ratios, although they do not provide information on the number of teachers _per se_. The ratios are smaller than those we have calculated because defendants include librarians and counselors. We have discussed this problem in Chapter IV.

We have nonetheless employed these data to calculate the average pupil-teacher ratio for schools west of the Park and Anacostia. We find the following:*

Pupil Teacher Ratios--Latest Data

West of Park	Anacostia
18.4	23.8

Thus, by whatever data, schools west of the park are advantaged with respect to the pupil-teacher ratio.

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*Defendants give 18.3 as the average west of the Park. We assume there is a rounding error involved in this slight discrepancy.

1. Relationship Between Pupil-Teacher Ratio and ADM

Defendants argue that the pupil-teacher ratio is a function of the size of the school only.[*] We performed a regression analysis of the form:

$$P/T = a + b_1(ADM) + b_2(ADM)(RC) + B_3(ADM)(ANAC)$$

From this equation we can ask whether the relationship between size and pupil-teacher ratio is the same in all areas of the city, where we define:

P/T = pupil-teacher ratio
ADM = membership data
RC = a binary variable denoting schools west of Rock Creek Park
ANAC = a binary variable denoting schools in Anacostia

From this equation we determined

1) That ADM alone explained only 16.4% of the variation in pupil-teacher ratios.

2) That in general it would require an increase in school size of 200 students to increase pupil-teacher ratio by 1 student.

3) That this general figure becomes 300 when the differences among regions are accounted for. The relationships remain as they were in Anacostia and Rock Creek Park. That is, in these areas, there is a stronger relationship between size and pupil-teacher ratio than in the rest of the city.

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[*] See Defendants' Memorandum of November 17, p. 42.

However, the (ADM)(RC) variable was not significant. By dividing the RC variable into variables for our Groups I and II, we find the following

$$P/T = 18.80 + .0037ADM + .0151(ADM)(RC1) + .0018(ADM)(RC2)^{*} + .00235(ADM)(ANAC)$$

or

$$\begin{aligned} P/T &= 18.80 + .0037ADM \text{ in general} \\ &= 18.80 + .0188ADM \text{ in Group I} \\ &= 18.80 + .0055ADM \text{ in Group II}^{*} \\ &= 18.80 + .0060ADM \text{ in Anacostia} \end{aligned}$$

Taking the formula

$$P/T = 18.80 + .0037ADM$$

we can calculate the expected difference between a small school (say, 500 pupils) and a large school (say, 1000 pupils). The equation estimates that the schools would have the following pupil-teacher ratios:

Pupil-Teacher Ratios in Two Regular Schools

ADM	P/T
500	20.65
1000	22.50

This relationship does not hold west of Rock Creek Park, or in Anacostia. Since there are no schools with this size variation west of the Park, we look at the Anacostia area:

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[*] The ADM coefficient is not significantly different from the general one of .0037.

Pupil-Teacher Ratios in Two Anacostia Schools

ADM	P/T
500	21.50
1000	24.50

That is, varying around the mean school size, the Anacostia schools of equivalent size will have from one to two more pupils per teacher than schools in the rest of the city.

This indicates that there is no fixed relationship between size of school as measured by ADM and pupil-teacher ratio. The P/T ratio does seem to vary by 1 for one standard deviation of school size, but the relationship itself varies among regions. With more time we could investigate this problem more thoroughly, testing for the effect of special students and Model Schools on the size-P/T relationship.

To calculate the overall effect on pupil-teacher ratio of being in these various areas, we calculated a regression:

$$P/T = a + b_1 ADM + b_2 (ADM)^2 + b_3 \, PERSP + b_4 RC1 + b_5 RC2 + b_6 ANAC$$

where the symbols have been previously defined. A coefficient in such a regression does not vary with ADM, but gives the incremental effect of being in a region, accounting for the strong negative effect on pupil-teacher ratio of having special students. The effect west of the park was negative (though insignificant) in Group II, positive and significant in Anacostia and in Group I. Accounting for Model Schools both areas west of the Park are at the average of the areas other than Model Schools and Anacostia, with Anacostia having in general a significantly higher pupil-teacher ratio--by over two pupils per teacher!--than the rest of the city. This is true having accounted for size. The entire equation explained 34.5 percent of

the variance of the pupil-teacher ratio.

Finally, we controlled for capacity utilization, on the assumption that this is a policy variable.* Schools do not have to be the size they are as measured by ADM. With capacity utilization accounted for, schools in Group II west of the Park are now seen to have below expectation pupil-teacher ratios. In this case, then, schools in Group II can be said to be favored over other schools, accounting for size. In this equation, as in the previous ones, Anacostia was definitely disfavored relative to the rest of the city.

As in Chapter VI, we must emphasize that we cannot distinguish between a technological relationship between size and pupil-teacher ratio, and a discretionary one. Ex post, whether because the school department wanted it or because conditions demand it, there is some relationship between size and pupil-teacher ratio. However this relationship itself is not the same in all areas, and controlling for this relationship we find that schools in Anacostia are definitely disfavored in terms of pupil-teacher ratio. It is simply incorrect to assert that size explains variations in pupil-teacher ratio. It is incorrect to assert that, correcting for size, there is no difference among areas. The case of the schools west of the Park is less clear, and would require further investigation. The Anacostia situation is unambiguous: accounting for size variations, schools in Anacostia have one to two more pupils per teacher than schools elsewhere.**

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*In this equation we still included two size variables, ADM and $(ADM)^2$, percent special, Model Schools, Anacostia and RC2 and RC1 for Groups II and I west of the Park.

**Compared to Model Schools, this difference may be as high as three, as Model Schools have significantly lower pupil-teacher ratios than ordinary schools.

3. Defendants' Scatter Diagrams

Defendants' argument about the relationship between ADM and School Size comes from their scatter diagram number eight, which plots pupil-teacher ratios against school enrollments. However, in addition to the inappropriateness of this technique,* Defendants seem to have distorted the data so that the correlation appears higher than it actually is. Specifically, schools in one administrative unit have been plotted either separately or together, depending (apparently) on which better fits the correlation. Schools west of the park, with low pupil-teacher ratios, have been plotted separately in order to emphasize small enrollments. This applies to the unit comprised of Hyde, Fillmore, and Jackson, for example. Anacostia schools with small enrollments but high pupil-teacher ratios have been plotted as combined schools, appearing to have high enrollments and thus fit the correlation. This applies to schools such as Carver, Orr, and Randle Highlands. Carver, for example, has a relatively small enrollment - 304 and a high pupil-teacher ratio - 25.3 If the Defendants consistently plotted each school separately, this point would appear in the upper left area of the graph, and not visually within the upward sloping scatter. By combining schools, the point is moved to the right, closer to the other points.

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* Cf. our position against arguing from zero order correlations, Chapter IV.

C. Education of Teachers

We have calculated the percentage of teachers west of the Park and in Anacostia who have Masters Degrees or higher. These are:*

% Teachers with M. A. or more

West of Park	Anacostia
21.6%	11.8%

These figures require no further comment.

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[*] Data from defendants submission "Degrees Held By Teachers - October 20, 1966," revised in pencil to October 16, 1969.

CHAPTER VIII

CONSEQUENCES OF 5% EQUALIZATION

We define "5% equalization" to mean that a school's per pupil teacher expenditure must fall within an interval from 5% above to 5% below some standard number. This plan, which is the one we advocate in our memorandum to the Court, would designate an average per pupil teacher expenditure, and require all District schools (except special and compensatory) to fall within ±5% of that average. Expenditures need not be equalized in this way in special and compensatory schools. To illustrate this procedure, we will examine fiscal 1971 data excluding Special Schools and Model Schools. The mean teacher expenditure per pupil would then be $497; a 5% range would include schools spending as little as $472 and as much as $522. We have calculated the number of children in schools above and below this range, by $25 intervals. In addition, we have calculated the number of needy children in each interval. This information appears in Tables VIII-1 and VIII-2.

To bring all schools within the 5% range, expenditures would be reduced on 26,232 children in 54 schools currently spending above $524. The reduction in teacher expenditures in these schools would be $2,019,982 if they are just reduced to the upper extreme of the range. These schools contain 10,272, or 30.1% of

all needy children.* The defendants fail to note, however, that 34,086 children in 35 schools would gain from this equalization, and of these, 12,412 receive free lunches. If these schools are brought to the bottom of the allowable range -- still $48** below the highest schools -- they will receive an additional $2,012,470.

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* We note that this is well below the figure of 13,000 mentioned on p. 27 of the Defendants' Memorandum.

** To bring schools within the range we brought teacher expenditures below the mean up to $473 for each school and down to $521 for those above.

TABLE VIII-1

Distribution of Children in Low Expenditure Schools[a]
(Teacher Expenditure On Pupil, Fiscal 1971)

Dollars Below Mean	Number of Children	Number of Needy Children	Expenditures to bring School to $475 Average per Child[b]
25-50	10672	3416	88,898
50-75	8057	3236	287,856
75-100	4356	2045	293,005
100-125	2493	947	215,518
125-150	4465	1251	517,978
150-175	3289	1190	427,633
175-200			
200-225			
225-250			
250- 275	754	327	191,094
	34,086	12,412	$2,019,982

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[a] Figures from authors' calculations of per pupil teacher expenditures, from defendants' submission of revised data, November 6. Needy children from revised free lunch data, November 27.

[b] This figure is the product of the number of children in the school and the average expenditure per child to bring expenditure per child up to $473 down to $521.

TABLE VIII-2

Distribution of Children in High Expenditure Schools[a]
(Teacher Expenditure per Pupil, Fiscal 1971)

Dollars Above Mean	Number of Children	Number of Needy Children	Expenditures to bring School to $475 Average per Child
25-50	3183	1527	34,544
50-75	8830	3303	332,925
75-100	3975	1798	252,623
100-125	3876	1122	344,964
125-150	2875	1298	340,671
150-175	--	--	---
175-200	1300	219	205,721
200-225	708	518	131,635
225-250	767	420	159,588
250-275	377	16	93,692
275-300			
300-325			
325-350			
350-375	341	51	116,107
	26,232	10,272	$2,012,470

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[a] See note to Table VIII-1.

We will outline the procedures which clerks in the school department can follow to determine if the schools comply with the equalization standard proposed here. This will result in a tabular presentation to the court and the public, from which it can easily be determined if any school is in fact outside the bounds of the order.

1. By November 1st of any year the superintendent designates which schools are special schools.

2. At the same date, the superintendent designates which schools are compensatory schools.

A clerk performs the following calculations:

3. List and count the remaining schools.

4. Add the Average Daily Membership to date of each of these schools to arrive at a total ADM for all these schools.

5. Add the annual salaries of all the teachers in each of these schools to arrive at a total teacher cost per school for these schools.

6. Add together the total teacher cost in each of these schools to obtain the total teacher cost for all these schools.

7. Divide this total teacher cost (#6) by total ADM (#4) to obtain the equalization standard (mean expenditures per pupil).

8. Multiply .05 times the number just obtained in no. 7 above, and derive the lower bound of the range by subtracting this number (5% of the average per pupil expenditures for teachers' salaries) from the standard (#7). Find the upper bound of the range by adding 5% of the standard to the standard.

9. Provide a list of schools with all the information outlined above.

The question is, does each school's average per pupil teacher cost fall within a 5% range around the standard -- the mean per pupil teacher cost for all schools being considered? This is easily determined by comparing the actual cost in each school with the bounds of the range, given at the beginning or end of the tabular presentation.

CHAPTER IX

SUMMARY AND CONCLUSIONS

We have made several major points. We will list some:

1. There is great variation in per pupil teacher expenditures among elementary schools in the District of Columbia. (Chapter II)
2. This variation is not random, but favors schools west of Rock Creek Park and disfavors schools east of the Anacostia River. (Chapter II)
3. Defendants' arguments have failed to show that this expenditure pattern is technologically necessary. (Chapter III)
4. Defendants fail to show that the 5% equalization plan in the previous chapter would be detrimental to the non-discriminatory plans and aspirations of the current school administration. (Chapter III)
5. Defendants fail to demonstrate that some expenditures, notably those for teacher experience (longevity) should be excluded from such an equalization order. (Chapter III)
6. Defendants have relied on data and statistical methods which are inappropriate to the questions

at hand, and obscure the actual pattern of favoritism based on income level and race lying behind school expenditure inequality. (Chapter IV)

7. Defendants have provided inconsistent and erroneous data, which nonetheless support plaintiffs' case. (Chapter IV)

8. Special schools should be excluded from any analysis of expenditures on typical pupils (Chapter IV), and compensatory schools (as well as special schools) should be excluded from equalization orders. (Chapter VI, VIII)

9. The bussing program in fiscal 1970 does not demonstrate that advantage was taken of opportunities to integrate racially or by social class the eight schools west of Rock Creek Park we have designated as Group II -- though (except for Jackson) the same holds true for the other schools west of the Park. (Chapter V)

10. Bussing did not effectively relieve overcrowding in fiscal 1970, though it could have. (Chapter V)

11. Children bussed to schools west of the Park apparently come from families with higher income, on average, than other children in the sending schools. (Chapter V)

12. Building has not been as effective as defendants claim in reducing overcrowding, and in any case it is the distribution of excess capacity which is at issue, and defendants have failed to distribute this capacity equally. (Chapter V)

13. Defendants have analyzed their options incorrectly, and thus offer policies and justifications for these policies which are insubstantial and incorrect. In particular, the analysis by which demountables are claimed economically superior to bussing is faulty. (Chapter V)

14. Defendants have misrepresented the concept and current knowledge about economies of scale in schooling. In particular, they do not consider the basic element that the _quality_ of education must be the same (or differences accounted for) in schools of varying size; and they do not recognize that there are for all practical purposes no findings of economies of scale in schooling. (Chapter VI)

15. The objection that defendants do not consider quality variation is important because the literature suggests that large schools are worse than small schools, and the test score data suggest that pupils in large schools score worse than pupils in small schools. (Chapter VI)

16. Defendants exaggerate the effect of variation in school size on school expenditure per pupil, whether teacher expenditure or regular D. C. expenditure. In particular, variations in size at most explain 15% of variations in per pupil teacher expenditure. Considering the data at hand, variations in size uniquely explain 7.5% of the variations in per pupil teacher expenditure, but additional data could lower this figure. (Chapter VI)

17. The above relationships are not necessarily technological. That is, variations in expenditure which correlate with variations in size may be imposed by the will of the school board. Defendants offer only hypothetical arguments that technology has imposed the size-cost relationship. (Chapters III and VI)

18. Despite the lack of control for equal educational quality, estimates as low as 8.6¢ per child saved on per pupil teacher costs are derived by multiple regression analysis. Proper controls, it is argued, would reduce the actual scale economy estimate to between 5¢ and 7¢ per additional pupil. (Chapter VI)

19. This degree of economy of scale cannot explain even one-third of the difference in expenditures between schools west of Rock Creek Park and the rest of the city. (Chapter VI)

20. After correcting for size, pupil-teacher ratios are seen to vary by area. Specifically, controlling for size variation, schools in Anacostia tend to have two more children per teacher than schools in the rest of the city. (Chapter VII)

21. Differences in this pupil-teacher ratio, as well as differences in teacher salary, contribute to the difference in expenditure per pupil between areas of the city. Particularly, as from the point above, differences in pupil-teacher ratio explain most of the difference between teacher expenditures per pupil in Anacostia and in the rest of the city. Lower pupil-teacher ratio and higher teacher salaries explain about equal amounts of the higher per pupil teacher expenditures in schools west of Rock Creek Park. (Chapter VII)

22. An equalization standard such as the one proposed by plaintiffs could easily and effectively eliminate unjustifiable variation in school expenditures. (Chapter VIII)